The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

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NOTICES :—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Closing Year

IT must frankly be said that 1920 closes in a rather depressing sunset. The improvement which has been hoped for ever since the war ended has not yet come. On the contrary the conditions of trade have latterly grown steadily more difficult, and at present for many the position is critical. There is, however, a feeling that we are now at the worst point, and that early in the new year recovery may begin. The position is not altogether to be wondered at. For some time past there has been an excess of loose money, which has been spent with an almost reckless freedom. Trade, in consequence, has experienced a neurotic and unhealthy activity at prices which seemed to recognise no limit. Now, at last, the margin of spare cash has disappeared, unemployment has reached serious dimensions, and the pressure of taxes and rates is felt the more because it comes just when reserves seem to have been exhausted. For some little time, therefore, the nation must practice a rigid retrenchment. In a little while, we believe, trade will begin to recover gradually, and the recovery, if slow, should be sound, because based on healthier and more natural conditions. Our best hopes, indeed, of 1921 is that it may witness a gradual return to more normal conditions of life and industry.

What is true of trade in general is true of chemical industry in particular. A period of unprecedented activity, much of it of an unwholesome character, has been succeeded by temporary stagnation. The speculative enterprises which the war encouraged will be severely tested, and if they come to an end there will be no great lamenting, except for the ill-effects in which they may involve others. Those who floated into the chemical trade on the war wave may float out again without leaving many mourners behind. On the other hand, the old-established firms of repute may hope to come gradually back into their own. The general feeling is that in 1921 chemical industry and trade may experience a recovery of a quietly healthy nature, and one, on this account, the more likely to endure.

As for ourselves we have to offer to readers of THE CHEMICAL AGE our heartiest appreciation of the support received throughout the year, and our indebtedness to the hosts of loyal friends whose help has made possible the continued progress this journal has made from its birth. It will be the publisher's aim to make it still more worthy of such loyalty in the year on which we are about to enter.

The Dyestuffs Bill Through

THE Dyestuffs (Import Regulation) Bill passed its third reading in the House of Commons on Friday with a majority of 86 votes. Introduced less than a fortnight before, it has passed through the Commons with unusual swiftness for so important a measure, and with no substantial change in its provisions, though some of its clauses were energetically contested by an active minority. The Lords have similarly passed the measure without change, and before the end of the year we may expect it to have become an Act of Parliament, definitely destined to run for ten years. The whirlwind campaign suddenly organised to ensure the passage of the Bill before the close of the session has thus achieved a remarkable success. It is only a few weeks since Government spokesmen were complacently announcing to inquirers their decision further to postpone the Bill until next year. The apparently indifferent attitude of the Cabinet on the one hand, and evidences that the interests opposed to the Bill were mobilising forces on the other, not unnaturally disturbed and alarmed the manufacturers, who, indeed, had every right to expect from the Government an honourable fulfilment of its pledges. The active and resourceful minds associated with the chemical manufacturing interest have every reason to be satisfied with the

result of what, without offence, may be described as their whirlwind campaign. It has been an object lesson in the value of organisation. It is quite possible that but for the existence of the A.B.C.M., and the hard work put into that organisation for some years past, the Government's original intentions might have been allowed to lapse or might, indeed, have been directly defeated. As it is, the Bill is already practically passed into law; the manufacturers have the guarantee they desired to enable them to establish a British dyestuffs industry adequate at the least to all British needs; it rests now with the dyestuff makers, in the ten protective years before them, to make good their position on the merits of their products, and if the rate of progress already achieved since the work began is maintained their efforts should not fail.

It would serve no purpose now to review the opposition, some of it on lines that never promised success. The principle of protection to the dyestuffs industry for a definite period of years having been endorsed by Parliament, the important matter that remains is the machinery set up by the Bill. Whether it is to work smoothly or not will largely depend upon the judgment of the Board of Trade in operating it. There is first of all the composition of the Advisory Committee. The manufacturers, it is true, have conceded the claim that the users should have a majority. They would have acted wisely, in our opinion, in extending this conciliatory spirit to the point of allowing the trader interest at least one representative. This is no time for insisting on fine distinctions between the various divisions of our commercial forces. The condition of national industry is so serious, the need of developing home and overseas commerce so urgent, the arrears to be made up so heavy, that divisive tendencies are as little to be encouraged to-day as they were in the most critical stages of the war. What is wanted is the most complete and united co-operation among all interests. The nation cannot afford to penalise or even to alienate the merchant class—the catalysts and activators of British trade—whose enterprise and initiative and keen commercial sense have made us the nation of traders we are. On this point both manufacturers and consumers might gain rather than lose in public confidence by a concession which, though small in itself, might have the large and beneficial result of eliminating friction in the working of the Act and securing whole-hearted co-operation in making it a success.

It may, we quite recognise, be retorted that if the merchant class have won less recognition than is their due it is their own fault in neglecting to organise their forces. That defect has, in part at least, been made good. The Chemical and Dyestuff Traders' Association, though only a few months old, has put up an excellent fight for the merchant interest, and the meetings of traders already organised in Manchester and London entitle it to the thanks and support of the whole trade. Its policy has been expounded with full and intimate knowledge of the needs and conditions of the trade, and with a moderation of statement which in the end commands immensely more respect than extravagant pretensions built upon sand. Two points in the traders' case deserve fair consideration. One is the demand for direct representation on the Advisory Committee. The other is that the manufacturers, secured now in their own position, should refrain from discriminating against the merchant interest by refusing supplies to traders whether for home or for foreign needs. The nation has no energy to spare to be expended in friction; what is essential, if we are to hold our place, is conciliatory and co-operative effort for the good of British trade and commerce as a whole.

A Motor Fuel Suggestion

THE possibilities of employing naphthalene as a fuel for internal combustion engines have again been brought in evidence by the suggestion of Mr. L. S. Palmer that it proves quite satisfactory when dissolved in benzol. Before discussing Mr. Palmer's proposals it will be interesting to turn back to 1914 when experiments—eventually impeded by the outbreak of the war—were carried out with naphthalene in the solid state. Owing to its comparatively high boiling point this hydrocarbon is, of course, a solid at ordinary temperatures; and while this is, perhaps, a disadvantage, a change to the vaporous form is easily effected by employing a reservoir jacketed by the exhaust gases, the engine being started and warmed up on petrol. In 1914 it was estimated that the cost of naphthalene fuel would approximate to 0.4d. per b.h.p. hour, while it was pointed out, from the point of view of supplies, that this country then produced about 130,000 tons per annum, the price at that time ranging around 90s. per ton. The naphthalene engine had, as a matter of fact, made considerable progress just prior to the war, and it may be noted that the product was extensively used as a fuel on the Trans-Siberian Railway.

Mr. Palmer's experiments have been carried out with naphthalene dissolved in commercial benzol to the extent of 15 per cent. by weight. The mixture thus yielded is about 3d. per gallon cheaper than benzol, and yields 3.4 per cent. greater mileage. A 15 per cent. solution has a density of 0.883 and a heat value of 17,705 B.Th.U. per lb., the corresponding figures for benzol being 0.865 and 17,483, and road tests with a 2¾ h.p. two-cylinder motor-cycle showed it to give 107-8 miles per gallon, as compared with 104.9 for benzol. With stronger solutions there was a persistent falling off in efficiency. This falling off occurred whether or not "full air" was supplied, and seemed to indicate that these solutions were either not completely burned or were not introduced into the cylinders as concentrated as was supposed. Since they tend to deposit naphthalene, the latter is probably the correct explanation. With solutions of naphthalene in petrol a concentration greater than 5 per cent. is not likely to be practically usable at ordinary temperatures, and the heat value would be only 1.5 per cent. more than that of petrol—an increase too small to be of much advantage.

Assuming a mileage of 50 to a gallon of benzol, an increase of 3.4 per cent. might be expected with a 15 per cent. solution of naphthalene in benzol. With benzol at 2s. 9d. per gallon the cost per mile would be 0.66d. A gallon of 15 per cent. solution would cost 2s. 6d., if naphthalene cost £7 a ton, this perhaps

unexpected reduction being due to the fact that slightly less than 0.89 of a gallon of benzol will, with 15 per cent. by weight of naphthalene, form one gallon of solution. At 51.7 miles per gallon the cost per mile would be 0.58d., or a saving of 8d. per 100 miles. This estimate neglects the cost of manufacture of the solution which, however, would be very little, since only the addition of the naphthalene is needed to make it.

Brunner, Mond, Canada, Ltd.

THE establishment at Amherstburg, Ontario, of a plant for the production of soda ash by Brunner, Mond, Canada, Ltd., enables the Dominion for the first time to produce by means of a Canadian plant the soda ash on which so many of its manufacturing concerns are dependent. Up to 1919, so far as is known, no soda ash had been manufactured in Canada, though the annual consumption had reached the figure of forty to fifty thousand tons, all of which was imported, principally from the United Kingdom and the United States. The shortage of soda ash experienced during the war impressed the Canadian authorities with the danger of the position, and steps were taken to establish a permanent Canadian source of supply. Brunner, Mond, & Co. and the Solvay Process Company of the United States, jointly formed as a new concern Brunner, Mond, Canada, Ltd., and preparations were made without delay for the construction of a plant to manufacture soda ash by the Solvay process at Amherstburg, Ontario, on the Detroit river.

The site of the new plant is just separated by the river from the Detroit plant of the Solvay Process Co., and is reported to possess exceptional natural advantages. According to our American namesake, the *Chemical Age* of New York, there are unlimited supplies of salt and limestone, both needed in the process, immediately accessible. Large limestone quarries lie within a mile of the plant, and are connected with it by the company's railroad. An eight-inch pipe line conveys brine from wells three miles distant bored to salt deposits 1,000 ft. below the surface. The central position facilitates distribution, and the transport facilities are ample. A tract of land over 650 acres in extent has been secured, and a modern plant has been erected with a capacity estimated to be equal to Canada's total requirements, and so planned as to allow of ready expansion should the necessity arise.

It has been the purpose of the company, we learn, to make this plant purely Canadian, in fact as well as in name. As far as possible the materials used in its construction were bought in Canadian markets, and were preferably of Canadian manufacture. The plant was completed and production began in the autumn of last year. The products, it is stated, have met with such a ready sale that already an additional installation is being laid down to enlarge the productive capacity of the works. Apart from its technical and commercial importance the enterprise has had good social effects. The work of construction provided regular employment over a considerable period for over 1,000 men, and about 400 are employed in operating the plant. Living conditions are reported to be good, and the works have brought a marked increase of prosperity to the district. The Government of Canada fully recognise the beneficial effects of the company's operations in the development of hitherto almost neglected natural resources, and in the provision of employment, much needed in many parts, for Canadian workmen. The enterprise, in short, seems to be characterised by the qualities which explain the success and steady development of Brunner, Mond & Co.'s operations at home.

Another aspect of the problem is the question of paraffin, petrol, and benzol mixtures. Much work has been done on such mixed fuels, and considerable difficulty has been experienced in burning the heavier component of the mixture. The tendency to the formation of mists in the induction pipe cannot be readily overcome except by the application of additional heat. In the case of petrol and paraffin the mixing of the two liquids produces practically no temperature change, and the resulting total volume is consequently unchanged, while the density of the mixture is the mean of the two constituents. This means that no true solution has taken place, and hence there is no reason to expect complete combustion of the heavier fuel. With only mechanical mixing there is nothing to prevent mechanical separation. This appears to be an essential reason for the effective combustion of naphthalene solutions and the ineffective combustion of paraffin mixtures. With benzol and paraffin there seems to be some evidence of at least partial solution, for a drop in temperature and a slight increase in the resulting total volume point to more than a simple mechanical mixture.

The combustion of a naphthalene alone in the various forms of naphthalene carburettor that have been devised is also closely related to the problem. With pure naphthalene additional heat is necessary in order to burn the fuel efficiently after it has been melted. By dissolving the solid it appears that efficient combustion can take place without the high temperature previously necessary and without the addition of the latent heat of fusion for every gramme of solid melted.

The Calendar

DEC. 29	Society of Chemical Industry (Nottingham Section) : 7 p.m.	Nottingham.
JAN. 3	Society of Chemical Industry (London Section) : 8 p.m.	Burlington House, Piccadilly, London.
4	Hull Chemical and Engineering Society : " Bye-ways of Municipal Engineering," by F. W. Bricknell. 7.30 p.m.	The Metropole, West Street, Hull.
4	Royal Photographic Society of Great Britain : " On the Results of the Demonstration of Portraiture by Artificial Light of October 5, 1920," by N. E. Luboskez	35, Russell Square, London.
7	Society of Chemical Industry (Manchester Section) : " An Industrial Research Association," by A. W. Crossley. 7. p.m.	Textile Institute, 16, St. Mary's Parsonage, Manchester.
7	Society of Chemical Industry (Bristol Section) : 7.30 p.m.	Bristol.

Micro-Organisms and their Industrial Uses

Cantor Lectures by A. C. Chapman

THE second Cantor Lecture on this subject was delivered by Mr. A. Chaston Chapman, F.R.S., at the Royal Society of Arts, on December 13.

In his first lecture Mr. Chapman dealt at some length with the amylo process for the production of alcohol and pointed out that the enzymes secreted by the moulds employed are very similar, if not identical, in their nature, and in their functions to those secreted by germinated barley, *i.e.*, those existing in malt. The great technical advantage and economy involved in the use of a small quantity of mould in the place of a much larger quantity of expensive malt would be apparent, but there was one common defect to both processes, viz., the loss of a considerable portion of the valuable nitrogenous constituents of the grain employed—the quantity amounting, on a rough estimate, to 30 or 40 per cent. of the total nitrogen. In addition both processes involved a very thorough cooking of the raw grain in order to effect the complete liquefaction of the starch and so render it amenable to the action of the saccharifying diastase of the malt or of the moulds.

Boidin and Effront had introduced an important improvement in making use of the starch liquefying enzymes secreted by certain bacteria. The bacterium found most suitable for the purpose was a certain strain of *B. mesentericus*, and by cultivating this in an alkaline medium in the presence of a considerable amount of oxygen, its starch liquefying activity was enormously increased. It was possible to obtain a preparation of the bacterial enzyme strong enough to liquefy 1,000 times its weight of grain, and by concentrating the culture medium under reduced pressure it was possible to obtain a liquid still more active. Special interest attached to this method because it involved the active co-operation of representatives of three classes of micro-organisms, viz., moulds, bacteria and yeast, each organism producing the appropriate and needful enzymes.

This process showed in what way the technologist might benefit by the extended study of micro-biology. At least one patent had been taken out for the production of citric acid from sugar, but whatever the commercial possibilities of the process, it was one which was of very great interest to the chemist from several points of view, and which was deserving of further study. In addition to citric acid, a number of other organic acids were produced through the agency of the lower fungi, and it was quite possible that with the extended and systematic study of the subject, the list might be considerably lengthened and methods might be discovered for producing cheaply a number of the rarer acids for which we are at present dependent on methods involving expensive syntheses. Two instances which might be mentioned were pyruvic acid and fumaric acid.

Lactic Acid

The suggested use of bacteria on a large scale for starch liquefaction led him to consider one or two other manufactures in connection with which we are largely dependent upon the activities of these minute organisms. The first of these was lactic acid. Since the time of Scheele, who appeared to have been the discoverer of lactic acid, it had been known that the souring of milk and other saccharine liquids when exposed to the air, was due to the formation of a non-volatile organic acid, but the exciting cause of the change necessarily remained obscure until the nature of bacteria had been studied and methods for their isolation and investigation had been devised.

With some of the organisms which had been specially isolated for industrial use, lactic acid was substantially the only product formed, but in many cases other substances were produced at the same time, among them being formic acid, acetic acid, propionic acid, butyric acid, alcohol, acetone, carbon dioxide and hydrogen. Whether each of these substances was the result of the activity of a special enzyme co-existing in the cell with the lactic enzyme was very uncertain, but it was clear that the process was, from the chemical point of view, a very complex one, notwithstanding the work of Pasteur, Lister, Henneberg and Berjerinck.

Manufacturers had not kept abreast of scientific developments and in many cases worked under serious disadvantages, as compared with their American and continental competitors. The lactic acid industry, like some other biochemical industries of this country, was to-day being carried on under technical conditions, but little superior to those existing at the time of its introduction. In his next lecture he would deal with some of the factors which were responsible for this state of affairs. Lactic acid was one of the many commodities which, as the result of cheapened production, had assumed very considerable industrial importance and there were good reasons to suppose that its possible uses were not by any means exhausted. As a raw material glucose was almost invariably employed, this being made in the factory from the cheapest starchy material available at the time. The stage in the process, which consisted roughly of five steps, with which he was mostly concerned for the purposes of this lecture, was the bacterial decomposition of the sugar. If it were possible to carry out this stage of the process by means of a synthesised enzyme of standard activity, the matter would be relatively simple. He could say without fear of contradiction that much of the acid produced in this country was made in a very haphazard manner with the result that it was of poor quality and quite unsuitable for a highly competitive trade. By far the most serious difficulty with which the prospective manufacturer was faced was the selection of the organism to be employed. Upon this the whole success of the process depended. He might take steps to isolate in one way or another the organism capable of giving him the results he required. In that case he would have to employ the services of someone possessed of considerable knowledge, not only of bacteriological technique, but also the habitat of the various lactic bacteria, their life-histories and other general characters and industrial properties. Even then it was by no means certain that he would succeed in obtaining the bacteria capable of giving the best results. The alternative to this laborious and highly technical procedure was to obtain the culture of a suitable organism from some person or institution, and this point he would deal with later.

Butyric Acid

As in the case of lactic acid, the number of bacteria producing butyric acid, either directly or indirectly, was very large, and there was much less uniformity of opinion as to the precise organism (or, indeed, as to the class of organisms) best suited for industrial purposes. It was formerly supposed that the production of butyric acid from glucose takes place according to the equation:

$$C_6H_{12}O_6 = C_4H_8O_2 + 2CO_2 + 2H_2,$$

but there appeared to be some evidence that the gases formed in the process of fermentation are the result of secondary reactions. We were very far from having arrived at the knowledge of the best and most economical conditions for the biochemical production of this acid. There seemed to be very little doubt that, as in the case of lactic acid, the active principle was an enzyme, and it would appear according to Stoklasa and his co-workers, and this enzyme usually appeared in bacteria together with the enzyme producing lactic acid.

Mr. Chapman then dealt with the manufacture of vinegar. He described the plant and the general nature of the acetification process almost invariably adopted. The acetifying plant, generally speaking, was simple, not to say crude, and apt to be inefficient and wasteful. Remembering that the temperature of the acetifying wash was well over 100 deg. F., that comparatively large volumes of air were being passed through during the whole of the process (which may take anything from a week to a fortnight) and that alcohol, aldehyde, and acetic acid were all very volatile substances, it was not surprising that the yields obtained in practice should fall very far short of those demanded by theory. By the use of a condensing pipe and washer a good deal might be done to reduce the loss, but a deficit of from 10 to 20 per cent. was very usual and much greater losses were not entirely unknown. In addition to the above sources of loss it had to be borne in mind that the acetic acid bacteria employed, or other organisms which accidentally gained admission were capable of oxidising and so destroying the acetic acid formed.

Notwithstanding the great advances made in many directions in industrial zymo-technology as the result of improved methods of bacteriological technique, the position of the vinegar industry had remained almost stationary. Apart from the crude apparatus employed, vinegar makers rarely, if ever, knew anything of the precise character of the all-important organism or organisms they were using,

Concluding Lecture

The third and concluding Cantor lecture by Mr. A. Chaston Chapman, on "Micro-Organisms and some of their Industrial Uses," was delivered at the Royal Society of Arts on Monday last.

Production of Butyl Alcohol

Mr. Chapman began with the consideration of a biochemical process of very recent introduction, in which the chemical changes were, apparently, of a complex character—viz., the production of butyl alcohol and acetone by a fermentation process. For a considerable time, he said, it had been known that butyl alcohol and other higher alcohols could be produced from carbohydrate materials, through the agency of bacteria. The first observation, that in some of these fermentation processes a certain amount of acetone was simultaneously produced, appeared to have been made by Schardinger in 1905, but it was to Fernbach that the credit belonged of having been the first to isolate an organism capable of producing substantial quantities of butyl alcohol and acetone from starchy materials. As was well known, the process was worked out on a commercial scale in this country, the main object at the time being to produce butyl alcohol in quantity, as a starting point in the manufacture of synthetic rubber. The process had been the subject of a good deal of heated controversy. All he would say was that it was generally admitted that to Fernbach belonged the credit of having discovered, in or about 1910, the process by which acetone and butyl alcohol were simultaneously formed from starchy materials, and that these included both maize and potatoes. The results obtained by the process were such as to show that acetone could be successfully produced on a large scale, and that under certain circumstances the biochemical method constituted a very valuable auxiliary method. Essentially, this method consisted in the bacterial fermentation of a starchy mash under strictly aseptic conditions, and the separation of the two main liquid products—viz., butyl alcohol and acetone—by fractional distillation.

As in the majority of biochemical processes, the first step was to secure a pure laboratory culture of the required organism. When this culture was found to be in a sufficiently vigorous condition, it could be used for the inoculation, in one or more stages, of a larger quantity of material in order to obtain ultimately a sufficient quantity for the pitching of a large fermentation tank. Some authorities, however, including Fernbach, objected to this progressive mode of working, and favoured the elimination of the seed tank and the working up of a sufficiently large quantity of laboratory culture for the full sized fermentation. Maize was the material used chiefly during the war, and considerable importance attached, not merely to the character of the maize used, but to the manner in which it was milled and cooked.

The vessels employed at the King's Lynn factory, where the process was worked at one time, were of 3,000 gallons capacity, but he understood that in the British Acetone Co.'s factory at Toronto, in 1918, there were no fewer than 22 fermenting vessels, each having a capacity of 30,000 gallons, and a total output of nearly 200 long tons per month. The fermentation under normal circumstances was complete in from 30 to 36 hours; but in the Canadian factory this appeared to have been shortened, in some cases, to as little as 24 hours. In the English factory the starchy mash was made of such a strength that it contained about 6 per cent. of maize; but the Canadian workers appeared to have employed stronger mashes than this and to have obtained their best results at a concentration of about 10 per cent. At its period of greatest vigour, gas was produced during this process at the rate of about 800 cubic ft. per hour, or a total volume of about 9,000 cubic ft. from a 3,000 gallon fermentation. Reilly and his colleagues, who had given considerable study to the reactions in the process, were provisionally inclined to the view that the mechanism of the changes involved might be similar to that suggested some years ago by Büchner and Meisenheimer to explain the formation of a butyric acid and butyl alcohol from glucose by the *bacillus butylicus*. According to this view, it was supposed that lactic acid was first formed, and that this was then converted into acetaldehyde and formic acid. The acetaldehyde condensed into aldol, and from this compound butyl alcohol was obtained by reduction, and butyric acid by a process of molecular rearrangement. Reilly and his colleagues pointed out that, although they had not succeeded in obtaining direct evidence of the formation of acetaldehyde or of formic acid in the acetone fermentation, the proportion in which the end products were formed accorded well with the correctness of this explanation, and a good deal of evidence was accumulating to show that a certain butyric acid organism, when acting on glucose, did give rise to the formation of acetaldehyde, and that this substance must be regarded as a very general intermediate product in the case of a great many fermentation processes in which yeasts and bacteria were the active agents. There was also some evidence that acetone was produced from butyric acid with acetoacetic, and as an intermediate product. It was clear that the mechanism of the process was a very complex one, and further work on the subject would be looked forward to with considerable interest.

Commercial Possibilities

So far as the commercial possibilities of the process were concerned, it was clear that if it was to compete successfully, in times of peace, with the ordinary process for the manufacture of acetone, several important conditions would have to be fulfilled. In the first place, manufacture could only be carried out, with any chance of profit, in those countries where the raw material (*e.g.*, maize, rice, &c.) was abundantly and cheaply grown, so that high freight charges on bulky material could be avoided. In the next place, it would be necessary to find some profitable outlet for the butyl alcohol, the quantity of which was twice as great as that of the acetone. A process had been patented by Weizmann and Legg for the conversion of the butyl alcohol into methyl-ethyl-ketone, and if this could be profitably worked, it might supply the solution of this particular part of the problem. It would also be necessary to find uses for the gases, or at least for the hydrogen, produced, and also for the constituents of the spent wash.

It was clear that much investigation was still needed before the process could be put on a satisfactory working basis, but it was an excellent example of the need, to which he had repeatedly called attention, for extended study in this country of micro-biology in its relation to chemical industry.

In this connection it might be interesting to recall that Northrup, Ashe and Senior had recently described an organism which produced acetone and ethyl alcohol from starch or sugar. This organism, to which the name *bacillus acetoethylicum* had been given, produced acetone, ethyl alcohol and formic acid, together with gaseous products. Its optimum temperature for the formation of acetone was 43°C., and it fermented pentoses as well as hexoses. The chief point of interest was that ethyl alcohol appeared to take the place of butyl alcohol in the process.

Industrial Micro-biology

Having so far confined his attention to certain useful chemical changes effected through the agency of micro-organisms, Mr. Chapman dealt with another and somewhat different aspect of the importance of industrial micro-biology—viz., the production of artificial nitrogenous foods. Many attempts had been made to find a profitable use for brewery yeast, the use of which in the making of bread had been entirely superseded by distillers' yeast. Brewery yeast had a considerable food value, as was seen from the following analysis:

Average Composition of Dry Yeast.

	Per cent.
Proteins and other nitrogenous substances	51·8
Yeast gum and other carbohydrate matter ...	28·5
Fat	2·0
Mineral matter	11·0
Matter undetermined	6·7
	100·0

For a number of years dried yeast commanded a considerable sale in Germany for cattle food, and owing to the high price which German farmers had been willing to pay for it, a good deal of the yeast dried in this country had hitherto found its way to the Continent. There was evidence, however, that farmers and stock feeders in this country were becoming alive to the value of this material as an economical and valuable adjunct to other feeding stuffs. From the drying of yeast for cattle food to the use of dried yeast for human food was an obvious step, and both in this country and Germany before the war dried yeast suitable for use as human food was prepared in somewhat considerable quantities.

Acid Elevators

By Basil Heastie, A.M.I.C.E.

THERE was a large attendance at the Manchester College of Technology, on Thursday, December 16, when Mr. Basil Heastie, A.M.I.C.E. (Kestner Evaporator & Engineering Co., Ltd.), delivered a lecture on "Acid Elevators."

Mr. Heastie said that in regard to the raising of liquids of a very corrosive nature such as sulphuric, nitric or hydrochloric acids, the adoption of the best method of elevation was a matter requiring the most careful consideration. In the raising of water a number of methods were in common use, *i.e.*, the ordinary plunger pump, the air lift, pulsometer steam pump, the Humphries gas pump for dealing with large quantities, and the centrifugal pump, the last named being extremely efficient. In dealing with corrosive liquors, often of a very viscous nature, none of the above-mentioned methods were entirely satisfactory, although by careful and special design stoneware or ebonite plunger pumps could be satisfactorily employed for pumping acids, or solutions of metallic salts, which decomposed upon contact with metals. The main objection, however, to this class of pump was the extreme difficulty in obtaining tight glands, *e.g.*, a pump delivering 1·72 sp. gr. acid to a Glover tower at a height of 85 ft. would have a static pressure of $\frac{85}{54} \times 14{\cdot}7 \times 1{\cdot}72 = 63$ lb., and if started up under this head it might rise considerably higher in order to overcome the inertia of a pipe full of acid. There was also friction loss, and thus, unless extremely well packed, the glands would leak. A very ingenious method of overcoming this difficulty had been adopted in the Kestner patent acid pump, in which a small clearance was given between the plunger and the gland. The fit being close, no packing was required, and the clearance allowed a small but definite quantity to leak to an annular chamber placed above the gland, from which it was drained back to the feed tank, the leakage being about 10 drops a minute, and the effect on the pump efficiency inappreciable. The pump body, plunger and valves were constructed in "Ironac," a high-silicon iron of extreme hardness and possessing great acid-resisting qualities. Efficiencies of over 70 per cent. had been obtained with these pumps. The average efficiency of small pumps of this type when lifting sulphuric acid of 1·72 sp. gr. to a height of 60 ft. was 69 per cent.

The centrifugal pump had been used with varying success for lifting acids, but in most designs there was trouble with leaking glands, the escaping acid also attacking the bearings and journals. In the result the high efficiencies obtained by centrifugal pumps when pumping water to high levels were not maintained when used for lifting acids. The centrifugal pump was essentially a high-velocity pump, having small clearances and constricted passages, except in large sizes, and when used for viscous liquids the friction loss was excessive. It was imperative that all pipes and passages through which viscous acids were passed should have ample area.

A new form of centrifugal pump had been recently put upon the market, arranged with a vertical spindle, the bearing being above the impeller (which rotated in a horizontal plane), but it had not received a sufficiently extended trial in actual work to warrant an opinion as to its reliability under the extremely severe conditions obtaining in a chemical works.

Air Lift

Although compressed air when used in an air lift was not particularly effective for lifting liquids, unless they were hot, it had been used more successfully for many years in conjunction with acid eggs. Having explained the general construction and method of operation of acid eggs, Mr. Heastie said that compressed air was supplied to the egg at a considerably higher pressure that that corresponding to the height to which the acid was to be raised, as the friction head loss for viscous fluids flowing in pipes was considerable. The efficiency of the egg largely depended upon the skill of the operator in shutting off the air immediately the gauge showed the air pressure had dropped, or, on the other hand, a trained attendant could detect by listening when all the acid had left the egg. In either method efficiency depended upon the personal element. If when working at 80-lbs. air pressure, the compressed air entering the egg through a $\frac{7}{8}$-in. diameter pipe, the valve remained open six seconds after all the acid was discharged, there would be a loss of about 100 c. ft. of free air. The theoretical horse-power required to compress 100 c. ft. of free air per minute to 80 lb. per square-inch gauge was nearly 14 H.P. (in 2-stage compressor); the actual horse-power lost would be much greater.

Kestner Acid Elevators—Intermittent Type

A Kestner acid elevator of the intermittent type was then described. The duty of the elevator (their smallest size) was to raise about 200 to 250 gallons per hour of sulphuric acid of 1.72 sp. gr. to a total height of 80 ft., through a 1 in. diameter lead pipe, the available air pressure being 70 lbs. per sq. in. gauge, 85 lbs. absolute. The general principle of this type of elevator was that immediately the air pressure increased in the body its effect was to close the acid inlet valve and cut off the supply of acid from the feed tank, and to force the acid up the discharge pipe. This continued until the acid rose to a height of about 73 ft., when the whole of the acid originally contained in the body would have passed into the discharge pipe, the air pressure having in the meantime increased from atmospheric to about 62 lbs. gauge pressure. The acceleration then lifting the column of acid through the remaining 7 ft., and the body being empty, the float shut off the air supply.

As the loss of pressure in the body, due to the expansion of the air, occurred at a slower rate than the loss of pressure due to reduced static head of the acid, the whole contents were blown over. When the last plug of acid was discharged, the pressure dropped to atmospheric.

Continuous Type

For the purpose of delivering acid into sprays, and for certain other purposes, it was necessary that the acid should be delivered continuously, and the Kestner patent continuous elevator was, therefore, designed for this purpose, having two cylinders filling and emptying alternately. These elevators, which had been used for discharging acid through sprays at 40 to 60 lbs. pressure on the sprays, were simple in operation, and had no working parts revolving in acid, the only parts subject to the acid being the inlet and outlet acid valves.

A Kestner patent elevator had been specially designed to meet cases where the exhausting of the air by the delivery pipe was inconvenient, such as when feeding filter presses, pulverisers, &c., or when the apparatus was being used for lifting acid giving off vapours, such as fuming sulphuric acid or sulphurous acid in solution. All the working parts of these elevators were fitted externally. It was, therefore, possible to make repairs without taking to pieces any part of the apparatus in contact with the liquid. The compressed air was admitted upon the air valve being opened by the rising of a float. There were also two check valves, one for feed and the other for delivery.

Air Temperature

It was doubtful if any cooling and consequent contraction of the air after expansion took place to any very great extent in practice as a certain amount of heat was generated by the friction through the orifice, which tended to raise the temperature. The temperature of the air in the main was usually only a few degrees higher than the surrounding atmosphere, as the compressor and air receiver were often at a considerable distance from the elevator, and there was thus a considerable drop of temperature between those points. Considerable economy could be effected by reheating the air by means of a steam heater, when there was a supply of steam available. This method had been largely adopted by engineers on the Continent, and was in common use where compressed air was conveyed long distances.

As the result of investigations made respecting the efficiency of the Kestner type of acid elevator it could be stated that the total air used per cycle was 0.216 lbs., representing a volume of 2.83 cubic ft. free air at 60°F. The theoretical work required to compress this to an absolute pressure of 85 lbs. was about 12,700 ft. lbs. The work done in lifting 2½ gallons of 1.72 sp. gr. acid against a total head, including 14 per cent. friction, of 91 ft. was 3,100 lbs. The efficiency was therefore 25 per cent. Assuming an air compressor with an efficiency of 80 per cent. and a further 10 per cent. drop in transmission, the power required would be less than $\frac{7}{8}$ H.P. The efficiency in this case was not high, but, as the power absorbed was small, reliability and low maintenance cost should outweigh other considerations.

Disintegrators and Sizing Apparatus

By W. A. Barron, M.Inst.M.M.

A lecture on "Disintegrators and Sizing Appliances for Ores, Rocks and Similar Materials," was given by Mr. W. A. Barron, M.Inst.M.M. (Fraser & Chalmers' Engineering Works), at the Manchester College of Technology on Thursday, December 9.

Mr. Barron said that in dealing with an ore containing mineral in a sulphide state the object of crushing was usually to free the sulphide particles so that they might be separated by some process of concentration, making use of a difference in specific gravity between the mineral and the rock. This separation was effected by machines known as "concentrators," and the process was generally called "wet concentration," or concentration by water. The concentrates required, for the efficient separation of the mineral contents of the ore, to be graded into sizes. The mineral particles were recovered in as coarse a size as their natural state in the ore would allow for the purpose of reducing losses by "fines" or "slimes" in any method that made use of specific gravity. As, for example, the mineral particles in lead or galena might vary in size from ½-in. cube down to one-hundredth of an inch, or finer; the mineral could only be recovered in as near as possible its natural size of particles by crushing in stages and by sizing and concentrating at each stage.

Mr. Barron then explained the stages of relatively coarse ore crushing by means of jaw-breakers of the "Blake" type, disc crushers, crushing rolls, high duty and Californian stamp mills, sizing by means of revolving screens or trommels, impact screens, and external trommels; classifying by Dorr classifiers, Spitzkastens and hydrometric classifiers.

Fine Crushing

The ball mill had of late years come very much to the front for crushing to 10 mesh and finer. It had to a large extent superseded the stamp mill in new installations. The German type of ball mill, with its internal screens, had given place to the American type, owing to the higher cost of upkeep of the German machine. The ball mill now used was of two types—the short cylindrical mill—like a short tube mill—and the Hardinge conical mill. Both these mills were fed at one trunnion and discharged at another trunnion at the opposite end of the mill. The conical mill was usually preferred in crushing for concentration, or where a granular product was required with a minimum of slimes or product below 200 mesh to the linear inch. The conical mill had only a short parallel part at its greatest diameter, near the feed end of the mill, and then tapered away to the discharge end. The ore might be fed to this mill as it came from the breaker at 1½-in. or 2-in. cube. The rough crushing took place in the part of the mill which had the greatest diameter, where the largest and heaviest balls were concentrated. The object of the taper was to classify the crushing balls and the ore according to size. The finer ore and the smaller balls arranged themselves by a natural gradation of size along the cone. The effect was an adjustment of crushing weight to size of particles, to maintain a granular product, and to minimise the amount of slimes. The final size of the product was determined by the rate of feed. Any sizing that might be necessary of the product of these mills was done outside the mill itself, either by a screen attached to the discharge trunnion of the mill, or by a series of independent screens.

Mr. Barron also explained the construction and method of operation of the parallel ball mill, by which, owing to the cylinder being parallel, the crushed material was subjected to the same weight of balls at the discharge end as at the feed end, a larger proportion of fines or slimes being thus produced.

In the case of both conical and parallel mills it was usual to feed the mills at a rate which discharged a certain proportion of over-size material, the object being to minimise the amount of fines or material of unnecessary fineness.

An explanation was then given of the Californian stamp battery for the crushing of auriferous ore, &c. The capacity of a modern stamp mill of 1,250 to 1,500-lbs. stamps crushing to 30 mesh was about 5 tons per stamp per day of 24 hours.

A mill in common use for fine crushing was the Chilian mill, which was a development of the edge-runner mill or mortar mill, or going back further still, of a mill used in South America for centuries, and still in use in China, for crushing ores. Another mill, which had its origin in California in the early days of gold mining, was the Huntingdon centrifugal roller mill, which 20 to 30 years ago ranked next to stamps in popularity, particularly for ores of a friable nature. Its use was now practically confined to the regrinding of tailings from jigs and concentrating tables, preparatory to further treatment. It was essentially a wet crushing mill, and did its best work on a feed which did not exceed 3/4 in. It was, therefore, not suitable for dealing direct with the product of a jaw-breaker, and was also limited in its product to between 30 and 50 mesh.

The tube mill was a development of the "chats" mill, a small tube mill that had been in use in Cornwall for regrinding "chats" or tin concentrates many years before the large modern tube mill was introduced for fine grinding or sliming gold ores for cyanide treatment. In West Australia, South Africa and other gold fields the gold was mostly so microscopically fine that it was necessary to grind the ore to extreme fineness to free the gold so that the cyanide solution might dissolve it as rapidly as possible. The ore was usually ground so that it would pass 150 or 200 meshes to the linear inch or 22,500 to 40,000 apertures to the square inch. The tube mill was used in most modern cyanide plants, and the grinding was usually done in cyanide solution. The rate at which the ore was fed to the mill determined the rate at which it was discharged and governed the size or mesh of the product. It was not practicable to screen so fine a product in the case of a large output, but by feeding at a uniform rate it was possible to so adjust the amount of ore going into the mill as to secure the size of product required with a minimum of over-size.

Economy of operation required that in all disintegration by stages the sizes below that to which crushing was next to be done should first be removed by screening or classification, not only to relieve the disintegrating machines of unnecessary work, but to avoid, where the object of crushing was the concentration of minerals, the production of fines or slimes which might lead to the loss of mineral, hence the importance of efficient sizing or classifying devices in all concentration plants.

Reduced Rate for Commercial Phosphoric Acid

To the Editor of THE CHEMICAL AGE

SIR,—We enclose copy of a letter received from the Ministry of Transport giving a favourable reply to our application for a reduced rate for the transport of commercial phosphoric acid, when despatched in 2-ton lots. The previous rate was Class 5. We consider that a reduced rate for truck loads is a step in the right direction.—Yours, &c.,

For HOVEY & LOWTHER, LTD.,
R. B. HOVEY, *Director.*

Sandbach, Cheshire, December 20.

MINISTRY OF TRANSPORT,
WHITEHALL, S.W.1.
December 15, 1920.

GENTLEMEN,—I am directed by the Minister of Transport to refer to your communications of October 14, and November 23, in regard to the rates applicable to commercial phosphoric acid, and to state that the matter has been in hand with the railway companies, and it has now been agreed to add the following entry at page 397 of the General Railway Classification of Goods:—

Packing.	Class Owner's Risk.	Condition.	Minimum Charge.	Conditions of Carriage.
In carboys.	3	Station to Station	2-ton loads	—

I am, &c.,
J. PIKE.

Messrs. Hovey & Lowther, Ltd.,
Wheelock Works, Sandbach, Cheshire.

Chemical Traders and Dyestuffs

Representative Conference in London

AT the invitation of the Chemical and Dyestuff Traders' Association a meeting of London Traders in Dyestuffs and Chemicals was held (as briefly reported last week) in the Commercial Sale Rooms, Mincing Lane, on Wednesday, December 15, and there was a very representative attendance.

Mr. T. T. Reynolds, who was unanimously requested to preside, asserted that as merchant traders whose scope included the importing and exporting of dyestuffs and chemicals they were vitally interested in the Dyestuffs Bill now evoking so much attention and interest. He claimed that the commercial history of Great Britain showed that the merchant interest had played a most prominent part in the building up the commercial supremacy attained prior to the war. The merchants discovered and imported raw material that in some cases made manufacturing possible, and they discovered and developed markets in various parts of the world. Moreover, the merchants by the exchange of commodity for commodity had materially assisted in making British products so highly appreciated in the world's markets not only as regards quality, but also by the moderation of prices and the excellent value given. The merchants had built up a highly organised and effective distributive machinery which deserved and must receive recognition and consideration. There was a time when Government officials were in many cases disposed to look upon merchants as parasites who could with advantage be dispensed with. Fortunately closer touch and practical experience had brought about a more correct appreciation of the actual position.

Mr. Kellaway's Tribute to Traders

Mr. Reynolds referred to a pamphlet recently issued by the Department of Overseas Trade which opened with a statement that "the fiercest struggle for foreign trade since our merchant adventurers first set sail will soon engage the whole fabric of British industry," and later asserted that there is ample evidence that the assistance already given by the alliance of the Department of Overseas Trade with British traders "has directly contributed to the expansion of British export trade." Mr. Kellaway also gave the full assurance that "no preferential treatment is made by the Department between the large and the small firms; between the manufacturer and the merchant." This was a highly satisfactory attitude, and the same spirit had been shown by the officials at the Dyes Department of the Board of Trade in the negotiations that had been taking place between the Chemical and Dyestuff Traders' Association and the Department.

Imports for Re-exportation

It was noted with approval that there was a definite clause in the Dyestuffs Bill conceding what had been suggested with regard to re-exportation, and under such regulations and safeguards as the Board of Trade imposed there would be free importations of dyestuffs and chemicals for transhipment and re-exportation. Assurances had been given that under certain conditions the traders' interests would be recognised by representation upon such advisory committees as exist or would be set up. It used to be said that the Board of Trade ignored the traders' interests. The very proper retort was that they could not recognise a trade that was not organised and that had no collective existence. This had now been remedied. The Chemical and Dyestuff Traders' Association had already got the support of the great weight of the trade behind it, and within a few months had obtained recognition, had been promised representation, and had secured the right of re-exportation. This was not a bad start, said Mr. Reynolds, and if the traders closed up their ranks and unitedly asserted their right to continued existence and to a fair share of Government attention and support they would not only demand, but obtain their due.

Manufacturers' Mistaken Policy

The Chairman then briefly referred to the definition of dyestuffs in the Bill as being fortunately more limited in its application than the definition of dyestuffs in the Peace Treaty reparation clauses, and urged the necessity of immediate collective action with a view to getting helpful amendments in Committee and to converting assurances regarding merchants' interests into actualities. He referred to the further menace to the traders' interests in the policy pursued by some of the less enlightened manufacturers of attempting to squeeze out the merchants, and he pointed out that it was neither logical nor defensible for the makers to plead for national help to maintain their own position and at the same time to deliberately work for the extinction of the merchant interest which had done so much to develop and expand British trade, and which was essential to its maintenance and expansion. The Chairman claimed that the existing organisation and machinery of the importers and exporters was by far the most effective and economical channel for the importation and for the distribution of dyestuffs and chemicals, and he asserted that if the State-assisted makers continued to refuse to offer their products for home consumption excepting directly to consumers or for exportation against orders in hand on the ground that the makers had their own export distributing medium, the traders must take this as a direct challenge to be accepted and fought to a successful issue. Many traders present joined in the discussion, including Mr. John Brown, of Sankey judgment fame, and many interesting suggestions were made.

The resolution previously passed by the Executive Council of the Chemical and Dyestuff Traders' Association and approved and endorsed by the general meeting of Manchester traders was warmly approved and endorsed by the London traders. This, along with the following resolutions passed, was sent forthwith to the President and Secretary of the Board of Trade, and to various M.P.s then engaged in Committee on the Dyestuffs Bill.

An appeal was made to all the traders present who were not already members to join the Association and, as was the case in Manchester, a number of firms intimated that they would do so.

The Chairman was heartily thanked for presiding.

Resolutions Passed

"This meeting of London traders in dyestuffs and chemicals approves and endorses the resolution passed by the Executive Council of the Chemical and Dyestuff Traders' Association on December 9, and of which a copy has been already sent to the President of the Board of Trade."

"That this meeting believes that it would be in the national interest to limit the duration of the Bill by making it subject to revision at the end of three years."

"That Government assistance should not continue to be so largely confined to one concern, but that it should be given on a wider basis with a view to co-operation and co-ordination and ultimately to a comprehensive national dyestuff industry."

"That this meeting strongly protests against any preferential or monopolist system being established in the importation of dyestuffs under licence, and urges that no licence for importation should be issued to manufacturers of dyes."

"That no Government Department should have the distribution of dyestuffs imported under licence."

"That manufacturers of dyestuffs who are Government supported should not discriminate against the merchant interests either in regard to quantity, price, or destination."

"That apart from synthetic dyestuffs and synthetic colours a detailed list of products to be prohibited should be printed and published forthwith."

"That it should be made perfectly clear that natural and vegetable dyes, earth and mineral colours, pharmaceutical chemicals and drugs are expressly excluded from the operation of the Bill."

Organisation of Railways

A MEMORANDUM drawn up by the Federation of British Industries on the subject of the Minister of Transport's proposals re the future organisation of railways, was forwarded to the Government on Monday. A memorandum by the Railway Companies was published recently in the Daily Press. The Federation, subject to the establishment of a genera scheme outlined in their Report, accepts a principle of grouping of the railways. They do not necessarily accept the exact groups of the White Paper. The new Groups, according to the Memorandum, when traffic is carried over the systems of any two or more, should work on the principles of "through rates," and "continuous mileage." The new Groups should be subject to Government control, and interference, as little as possible. The Federation are definitely opposed to state ownership and operation of railways, and suggests honourable rivalry between the Groups.

Big Chemical Conference

ONE of the largest meetings of English-speaking chemists ever held will take place in New York City next autumn, when the British Society of Chemical Industry meet with their American fellow scientists. Dr. Charles L. Parsons, secretary of the American Chemical Society, according to the *Paint, Oil and Chemical Review*, says: "The Society of Chemical Industry of Great Britain, which has branches in every quarter of the globe, has several sections on Canadian soil, including that in Montreal, which will be its host. There will be hundreds of delegates from Great Britain and from other nations where there are English-speaking chemists, as well as the Canadian members. At the conclusion of the meetings in the Dominion the delegates from abroad and many of their Canadian associates will cross the border and go to New York, where they will foregather with the metropolitan branch of the Society of Chemical Industry and also with the American Chemical Society. The British Society of Chemical Industry has approximately 8,000 members, while the American Chemical Society has a membership of 15,500."

The scientists will also attend the seventh annual chemical exhibition, to be held in the Eighth Coast Artillery Armoury in the Bronx.

Details of the various meetings in North America are now being given out under the joint auspices of the two societies. The regular meeting of the British Society of Chemical Industry will be held in Montreal from August 29th to August 31st inclusive, the delegates arriving on Canadian shores on August 27th. On the night of August 31st the British and Canadian chemists will go by special train to Grand Mere and Shawinigan Falls, where they will spend the following day. A special train will leave the Falls on the night of September 1st and will arrive the following day at Ottawa. Another special will leave Ottawa on the evening of September 2nd for Toronto, where September 4th will be spent.

The visitors will reach Niagara Falls on the Canadian side on Monday, September 5th, and the following day will be spent on the American side of the great cataract, inspecting the large electro-chemical plants in the vicinity. They expect to reach New York City on September 7th, where they will meet with the New York section of the Society of Chemical Industry and the American Chemical Society.

Another element in connection with the meeting is that the chemical forces of the world will come into a coalition in opposition to the German chemical industries, which to such a large extent dominated international trade and enforced a monopoly of the dye trade. The grip of the Germans upon chemistry having been broken, it is proposed that the Anglo-Saxon chemists shall do all they can to maintain the balance of power.

The Supply of Fertilisers

THE general position in regard to the supplies of sulphate of ammonia, basic slag and super phosphate of lime gives many grounds for satisfaction, particularly in the case of phosphatic manures. The following figures, extracted from the Statistical Returns obtained by the Ministry of Agriculture, indicate that both in the case of super phosphate and of basic slag a substantial increase in production is being obtained.

During the four months ending September 30, 1919, the production of superphosphate was approximately 117,800 tons, and during the corresponding period of 1920 the production was 157,500 tons. In the case of basic slag the production for the five months ending October 31, 1919, was 188,500 tons, and for the same period 1920 the figure is 262,300 tons.

Although the increase in the production of basic slag is very considerable, there is little doubt that it will not be sufficient to meet the whole of the continually increasing demand from farmers. Both in the case of superphosphate and basic slag, therefore, it is very desirable that farmers and merchants should place their orders early in order to secure their supplies. There is a special reason why this is desirable in the case of superphosphate. At the present moment the production of superphosphate very largely exceeds the deliveries, and unless farmers place their orders early there is a danger that, in order to avoid congestion at and consequent stoppage of manufacturers' works, it may become necessary to export large quantities which should be used in this country.

In regard to supplies of potash, the Ministry understands that there are now large quantities available from each of the two sources from which this country can draw supplies—Germany and Alsace Lorraine. In both cases prices are high, but this is inevitable in view of the increased cost of production, and the many other factors which are contributory causes of high prices. There can be little doubt as to the economic advantage to agriculture of the utilisation of potash manures even at the present figure.

Scientific Glassware Protection

AN important recommendation for the temporary protection of the scientific glassware industry against foreign competition has been made by the Sub-Committee appointed by the Standing Committee on Trusts. The sub-committee state that manufacturers of scientific glassware have incurred considerable losses since they undertook to manufacture this class of glassware, and although they are not able to report as to fairness or unfairness of past and present prices, they consider that such temporary support should be afforded to this new industry as is consistent with fairness to consumers. If this were done, probably within a reasonable time the industry would be able both to hold its own against foreign competition and to sell its productions at prices acceptable to the public. They refer in their report to the war effort of the British firms to replace foreign supplies by home manufactures, and their formation of the British Chemical Ware Manufacturers' Association in 1916.

According to the report, Government representatives are said to have given verbal assurances that the industry would be supported after the war if they helped the country in its time of difficulty. Firms did not feel justified in extending their works unless some form of safeguard against unfair competition from abroad were given to them so as to enable them to become firmly established in business. The nature of the foreign competition they have to meet may be gathered from the fact that, favoured by exchange rates and other conditions, goods of the kind now being made in this country are being supplied by Continental manufacturers at prices less than the actual cost of manufacture here, whereas for goods that are not yet being manufactured here prices are being charged by the Continental makers which mean to the consumer approximately five times the pre-war price of such goods. Manufacturers say that unless some safeguard is granted to them they will be compelled to close down their works and cut their losses. The Sub-Committee advocates prohibition of imports of scientific glassware, except under licence.

Dye Specialist's Deed of Assignment

At a meeting of creditors of Shaw & Ellis, of Derby, described as dye specialists, held on Friday, December 17, a statement of affairs was submitted. This showed that there were 28 unsecured creditors; 21 of these (whose claims amounted to £4,098 0s. 3d. out of a total of indebtedness of £4,349 6s. 8d.) were present or represented. It was explained that the debtor's position was wholly due to the present state of the market, and was in no way attributable to their fault.

A full statement of the stock on hand was produced, and fully discussed by the creditors. It was considered that such stock could be best realised under the guidance of a committee, with a trustee. Although the creditors were of opinion that the debtors' estimate of the realisable value of the stock was oversanguine, they anticipated that with the help of an expert committee it could be realised to ensure little (if any) loss to the creditors.

The following resolution was unanimously passed:—That the debtors be requested to execute a deed of assignment for the benefit of their creditors in favour of Mr. Oswald Ling, of Derby, corporate accountant, with a committee of inspection consisting of Mr. W. G. Wilson, director of Messrs. Chas. Page & Co., Ltd., of 47-51, King William Street, London; Mr. T. S. Cooper, of Messrs. Linfoot & Cooper, of Clayton, Manchester; Mr. Richard Naylor, of 18-19, Canada Buildings, 35, Brown Street, Manchester. These three creditors' claims amount to £1,582 13s. 7d.

In compliance with this resolution the debtors have executed a deed of assignment.

Society of Chemical Industry

Nottingham Section

AT the meeting held on Wednesday, December 15, with Mr. J. H. Dunford in the chair, Dr. E. B. R. Prideaux, M.A., F.I.C., gave a paper on "Theory and Practice in Chemical Industry, with Special Reference to Physical Chemistry."

While the principal difficulties which confronted the chemical industry were political and social in character, it also suffered to some extent from a neglect of theory by the practical man, who was usually in reality a great, though unconscious, theorist.

If industry was to be healthy and able to stand up against foreign competition, it must use all theories available, and for these it was still, as formerly, dependent largely upon the work of private investigators and the universities and technical colleges. The Department of Scientific and Industrial Research had done good work in fostering research in pure science, and the business community would be well advised to endow the universities in order to allow them to increase their staff and equipment. Nottingham had recently had a splendid example of private munificence.

Industrial research often took the form of applying the results of pure science.; for this it was important to be able to see quickly the bearings of all sorts of theories, and to seize essential results.

Chemistry had been branching out in many directions from the essential common stock, which was included in all university courses. The number of new theories was bewildering to the student and teacher, yet some of these, especially some included under physical chemistry, were essential to most work on the large scale, as well as to research upon improvements. Several instances were given. Methods were more and more required in analysis. The refractometer and many other instruments had been added to the hydrometer and saccharimeter.

One of the best examples of the use of theories, even if only of provisional character, to lead to new discoveries, was to be found in colloid chemistry. Specific illustrations were drawn from the British Association's reports on colloid chemistry, and particularly from that on soap by M. Bain.

In the discussion which followed, Mr. H. D. Richmond communicated a paper, in which he showed what a wide field there still was for theories of colloids in the dairying industry.

Several speakers emphasised the opinion that the physical chemistry taught at universities was insufficient for the needs of technical chemists. Some interesting details were given as to the need of physico-chemical control in operations such as the grinding and drying of ammonium nitrate, and as to the need for more accessible and numerous publications of physical constants.

In his reply, Dr. Prideaux alluded to the difficulties that are met in devising a suitable short course of lectures for evening students.

Zinc and Zinc-Rich Alloys

A paper on "Zinc and Zinc-Rich Alloys" was read by Dr. J. L. Haughton, of the National Physical Laboratory, Teddington, before the members of the Birmingham Metallurgical Society, on Thursday, December 16. Mr. A. Spittle (President) occupied the chair, and there was a large attendance of metallurgists and industrial chemists.

Dr. Haughton discussed those alloys containing more than 50 per cent. of zinc: the metal, he said, occupied a middle position between iron and what were known as the rare metals. The specific heat was practically the same as copper, and very much lower than that of iron or aluminium. In chill-cast alloys 1 per cent. copper raised the tensile strength, and as they added aluminium to the copper the tensile strength increased. In certain alloys a remarkable ageing effect was apparent, the metal expanding in a troublesome way. They got most of their strength effect out of the first 1 per cent. of copper. The pure zinc alloys had a higher compressive strength; those containing tin pressed much more easily. Extruded metal, while having magnificent properties, aged more than rolled metal.

The Chairman pointed out that during the war there was a great shortage of rich zinc alloys and pure zinc in rolled sheets. Much of the latter was imported from America, and he was impressed with its quality and ductility. It was said that zinc should contain 1 per cent. of lead, but the American material contained much less, and yet its ductility was superior to anything he saw of the English rolled zinc. He was interested to know that the addition of 1 per cent. of copper raised ductility and rolling properties of the alloy; but if its ageing properties were great, as suggested, it seemed that it would have to be discounted commercially.

Professor T. Turner, F.I.C. (Metallurgical Department of the University of Birmingham) pointed out that if a small quantity of metal were added to another they expected if the added material went into solution to have an increase of tensile strength, and a reduction of ductility. They also expected on annealing the ductility to be increased and the density decreased.

Mr. A. E. Tucker (Society of Chemical Industry) pointed to the value of distilled zinc, which was practically chemically pure, and stated that the process of distillation was largely in operation in the Birmingham district.

Mr. F. Johnson, M.Sc. (Birmingham Technical School) paid a compliment to Dr. Slater Price, formerly head of the Chemical Department, and now Research Chemist, Photographic Association, for pioneer work by which they developed a satisfactory method for the electrolytic determination of zinc.

Fertilisers

DETAILS of the monthly and average prices of the various fertilisers are given in Table 39 of the Board of Agriculture for Scotland Agricultural Statistics. Vol. VII., Part III. (cmd. 1058). The prices of certain fertilisers were regulated by Orders, under which maximum prices were fixed. Under the Fertilisers Prices Order, 1918, maximum prices were fixed for the sale of sulphate of ammonia, superphosphates and ground basic slag as from June 1, 1918, to May 31, 1919. These prices were on the average the same as those ruling in 1917-18, except that in the case of basic slag a small increase in price was allowed to cover the increased cost of manufacture. Nitrate of soda averaged £25 17s. per ton, as compared with £22 5s. 5d. in 1917, and sulphate of ammonia £15 8s. 7d., as compared with £15 11s. 6d. Superphosphates containing 30 per cent. soluble phosphate averaged £6 9s. 9d., as against £6 7s. in 1917.

AVERAGE PRICES OF FERTILISERS IN SCOTLAND FOR THE YEAR 1918

Description.	Guaranteed Analysis.*		Year. Per ton. £ s. d.
	Per cent.		
Nitrate of Soda	N.	15½	25 17 0
Sulphate of Ammonia	N.	20	15 18 7
Superphosphate	S.P.	26	5 18 2
,,	S.P.	28	6 7 0
,,	S.P.	30	6 9 9
,,	S.P.	35	7 9 8
,,	S.P.	38	8 4 0
Basic Slag †	I.P. 6 / C.S.P. 24		3 2 6
,, ,, †	I.P. 6 / C.S.P. 26		3 8 9
,, ,, ‡	Tot. Phos.	18	3 6 0
,, ,, ‡	Tot. Phos.	22	3 10 0
,, ,, ‡	Tot. Phos.	24	3 12 2
,, ,, ‡	Tot. Phos.	26	3 16 0

* Abbreviations:—N.=Nitrogen; S.P.=Soluble Phosphate; I.P.=Insoluble Phosphate; C.S.P.=Citric Soluble Phosphate.
† At the Works. ‡ Calculated in terms of tribasic phosphate of lime.

IN the presence of a large number of Danes and representatives of British Universities the Anglo-Danish Students Bureau was opened last week at the house of the British Universities Bureau, 50, Russel Square, London, by H.R.H. Princess Margrethe of Denmark. The object of the bureau is to afford a centre of information for Danish students studying in this country, and for British professors and students proposing to visit Denmark.

The Dyestuffs Bill

Third Reading Carried by 86 Votes

IN the resumed discussion on Friday, December 17, in the House of Commons on the Dyestuffs Bill, the following amendments were moved and rejected :—

Major BARNES moved the following : "The prohibition of the import of any specified class or description of goods under this Act may be terminated by order of the Board when it has been proved to the satisfaction of the Board that goods of such specified class or description manufactured in the United Kingdom are being sold by the manufacturers thereof for exportation at a price lower than the market price of similar goods in the United Kingdom at the time of such sale." This was rejected by 151 votes to 31.

Major MACKENZIE WOOD moved a new clause to the effect that no manufacturer of synthetic organic dyestuffs should pay a dividend, or distribute profits, amounting to more than 8 per cent. on paid-up capital.—Rejected by 158 votes to 35.

Colonel P. WILLIAMS moved a new clause providing that any license to import granted by the Board of Trade under that Act should continue in force until it was proved that similar goods were manufactured in the United Kingdom, when notice should be given to the holder of the license to terminate the license at the expiration of four weeks.—Rejected by 164 votes to 38.

Major BARNES moved an amendment to Clause I., limiting the exclusion of dyes to those manufactured in Germany.—Rejected by 163 votes to 26.

On Clause 2, which empowers the Board of Trade by license to authorise, either generally "or in any particular case," the importation of any of the goods prohibited to be imported by virtue of the measure. Major MACKENZIE WOOD moved to omit the words, "or in any particular case."—Rejected by 170 votes to 25.

Mr. T. SHAW moved an amendment to the effect that the licensing committee should include four persons concerned in the manufacture of cotton cloth, of whom two should be the representatives of the workpeople employed in such manufacture.—Rejected by 146 votes to 24.

The third reading was carried by 116 for and 25 against, a majority for the Government of 86.

The Bill in the Lords

On Tuesday in the House of Lords Viscount Peel moved the second reading of the Bill, Lord Emmott moved as an amendment "That this House declines to proceed at this period of the Session, and without further inquiry, with a Bill which will have injurious effects on the textile industry of this country." He said that the President of the Board of Trade had, during the last few weeks, made a bargain with one small section of the trade, not with the great bulk of the textile trades at all, and had brought in this Bill hot-haste to give effect to that bargain. Lord Cawley, who stated that he had been engaged in the dyeing and printing industry the greater part of his life, seconded the amendment. The principal defenders of the Bill were Lord Moulton, who stated the general case for special treatment, and Lord Milner, who declared that if they delayed protecting this industry there would be no industry to protect. The amendment was rejected by 47 votes, and the Bill read a second time.

The House of Lords went into Committee on the Bill on Wednesday. Lord Buckmaster moved to except from the operation of the Bill a list of 25 chemicals, including acetone, tartaric acid, salicylic acid, naphthol, carbolic acid, and gallic acid. Viscount Peel resisted the amendment and contended that those products which were not used in the manufacture of dyestuffs would not be excluded by the Bill, and if the others were not kept out of the country it would defeat the object of the measure. Viscount Haldane, in supporting the amendment, said that acetone, which was the most powerful solvent, might at any time be used in the manufacture of dyestuffs, and would then come under the prohibition of the Bill. Lord Sheffield suggested that the insertion of words giving the President of the Board of Trade power to frame an exempted list of products not mainly used in the manufacture of dyes, the list to be varied from time to time as the Minister might direct. Viscount Peel said that before the war we were dependent very largely on Germany for intermediates. We must maintain the manufacture of intermediates here to make dyestuffs, and therefore they could not be allowed to come in freely. He understood that there was to be no list of the prohibited articles. It was well known in the trade what these articles were, and those who wished for a licence to import any of them would make application to the Committee. It was not proposed to put into a schedule those products which did not come within the ambit of the Bill. The amendment was defeated by 58 votes to 18.

An amendment by Lord Emmott providing that a licence should in no case be refused unless the Committee was satisfied that an adequate quantity of British-made dyestuffs equal in kind and quality to those proposed to be imported was actually available at a reasonable price, was rejected by 46 votes to 18—majority against, 28.

The Committee stage of the Bill was concluded, and it was reported without amendment to the House.

Chemical Matters in Parliament

Wet Carbonising, Ltd.

Mr. HOGGE asked the Prime Minister (House of Commons, December 20) at what date the Government made a grant to Wet Carbonising, Ltd. ; what was the amount of the grant and on what terms ; and for what purpose the grant was made ?

The PRIME MINISTER : I am informed that no grant has been made to Wet Carbonising, Ltd. In the summer of 1917 certain expenditure was incurred by this company on behalf of the Government in connection with the scheme for the erection of a factory in France for the manufacture of peat briquettes for the use of the forces in the trenches. This expenditure, amounting to about £10,000, was advanced by the War Office.

British Glass Industries, Ltd.

Mr. A. SHORT asked the President of the Board of Trade (House of Commons, December 20) whether the Sub-Committee appointed by the Standing Committee on Trusts to inquire into the operations of combinations in the glassware and glass bottle trades reported that the operations of the British Glass Industries, Ltd., gravely reduced any chance of glass bottles reaching the consumer at reasonable prices ; and, if so, what action, if any, does he propose to take ?

Sir ROBERT HORNE : The Sub-Committee reported in the sense indicated by the hon. member. They further stated that they were informed that it is not the intention of the principal companies concerned to force up selling prices, but rather to obtain a large output and to sell as cheap as possible ; but the Committee were not satisfied that this policy would necessarily be carried out. The Committee made no specific recommendations ; but as the manufacture by automatic machinery in this country is controlled by British patents, any abuse of the monopoly can be made the ground for an application either for revocation or for a compulsory licence under Section 1 of the Patents and Designs Act, 1919.

Employment in Lead Processes

The Lords amendments to the Women and Young Persons (Employment in Lead Processes) Bill were considered in the Commons last week. Their amendments are largely the result of representations made on behalf of the chemical industry respecting the provisions of the measure as passed through the Commons, and they were all agreed to.

Nitrogen in Sewage.

According to the report of the Development Commissioners, the total amount of nitrogen contained in the sewage of the United Kingdom is estimated at 230,000 tons, which is equivalent to 1,150,000 tons of sulphate of ammonia. Under present conditions most of this is wasted, only a small portion finding its way on to farms. Dr. Fowler and his assistants at Manchester devised a new method of dealing with sewage, and it is being tested at Rothamstead by Messrs. E. H. Richards and G. C. Sawyer. It is found to yield sludge much richer than any of the other methods and of very distinct promise as a fertiliser. No less than 15 per cent. of the nitrogen present was recovered in this experiment, and the sludge instead of being useless as manure proved to be very effective. The general adoption of this method, assuming the same percentage of recovery, would add considerably to the supplies of organic manures.

From Week to Week

Mr. H. W. Sillem has resigned from the directorate of the nglish Beet Sugar Corporation, Ltd.

One of the earliest members of the Sheffield Pharmaceutical and Chemical Society, Mr. Thomas Mayor, died a few days ago at the age of 80.

On Saturday the death occurred at Holmfirth of Mr. Frederick Bertram Shaw, aged 48, who was a member of the United Chemists' Association.

£5,000 damage was caused by fire at Burnbank Chemical Works, Paisley, last week. Fifteen tons of dried blood and some valuable machinery were included in the damage.

Mr. Roscoe Brunner of Northwich and Mr. Emmanuel Jausses, of Brussels, are among the directors of the Allied Chemical and Dye Corporation, Chartered on December 17 at New York.

An accident occurred at J. W. Leitch & Co., chemical manufacturers' works, Milnsbridge, on December 13. Mr. Clifford Pitchforth caught his hand between the blocks used for raising goods.

British Dyestuffs Corporation has deposited a Bill for next Session to absorb the railways in Manchester constructed under the powers granted by the Levinstein (Ltd.) Railways Act, 1917.

A general meeting of the Association of Science Teachers will be held on January 4, at University College, London. Miss M. B. Thomas, Girton College, will deliver the presidential address. Dr. Drummond, physiological chemistry reader, University College, will give a lecture on "Vitamines."

The Secretary of the Society of Chemical Industry announces that, owing to the urgent necessity for economy, the Council has decided that no issues of the *Journal* for 1921 will be sent to a member until his subscription for that year has been received by the hon. treasurer.

Chesterfield Tube Co.'s works, which closed on December 24, 1920, will re-open January 3, 1921. To prevent delay and detention of railway stock, goods must not be forwarded until December 31. Responsibility for demurrage will not be accepted on railway wagons despatched between those dates.

At Sheffield Chemical Co.'s works on Saturday, December 18, an accident occurred to George Worthy while cleaning a pipe with a force-pump, using vitriol. The nozzle of the pump slipped off the pipe and the vitriol squirted into the man's face and over his body, causing terrible injuries. Total blindness is feared.

The marriage of Mr. G. Scott-Robertson, recently appointed to the agricultural chemistry lectureship, at Queen's College, Belfast, and formerly head of the chemistry department at the East Anglian Institute of Agriculture, took place at Bocking; the bride was Miss Olga Warner Pratt, daughter of the late Mr. H. W. Pratt, of Sheffield.

In memory of the late Mr. William Briggs, chemical manufacturer, of Arbroath, and his wife, their son Mr. William Briggs, resident in America, has intimated a gift of £50 to the Poorhouse Committee of Arbroath and St. Vigeans Parish Council to be spent on New Year entertainments of the inmates.

ONE of the neatest pocket card and note cases we have received this year is issued by R. W. Greeff & Company, Thames House, Queen Street Place, London, the well-known chemical firm which was recently registered as a limited company. Its quiet but good style is in keeping with the sound and dignified traditions of the firm.

According to the census of 1919 the number of existing chemical companies in Italy was then 306, with a total capital of 453,405,560 lire. Most of the factories are in Lombardy, Latium, Piedmont and Liguria, though many important plants are in Rome. In 1917 twenty-four new companies were started, in 1918 forty-nine, and in 1919 sixty-four. The new capital is more than 500 million lire.

James Richard Farnsworth, partner of G. H. Farnsworth & Co., Lumsdale, Derbyshire, bleaching and dyeing firm, has been sentenced at the Tower of London, by general court-martial, to two years' hard labour. Four charges of desertion and absence without leave from the Irish Guards at Caterham Barracks, Surrey, and of escaping till apprehended were brought against Farnsworth. According to the prosecution he was arrested on one occasion, but broke his bail of £1,000. Sentence was promulgated on Tuesday. The General Officer Commanding the London District remitted six months of the sentence.

The United States committee in charge of the great chemical and dyestuff amalgamation of General Chemical, the Solvay Process Company, Semet-Solvay, The Barrett Company and National Aniline and Chemical Company, announce that the consolidation has become operative. The plan will be carried into effect as from January 1, 1921, and temporary stock certificates for the new stock, both preferred and common, will be ready for distribution about January 6.

Aschersleben Potash Works development, states the president, has been due to the full utilisation of the bituminous coal properties which the company acquired. Vast extensions are to be organised to meet demands from the United States for potash at highly remunerative prices. Great success has been realised by the Kali Works owing to the sale of kali salts to America, from which, owing to the state of the valuta, great gains have been won. The lack of wagons prevented larger trade. Trade is being developed with Italy, Serbia and Switzerland.

The Commercial Counsellor to H.M. Embassy at Rome reports to the Department of Overseas Trade that, according to a communication from the Havas Agency published in the *Popolo Romano* of November 16, an agreement has been concluded between the French and Italian Governments with respect to the supply of phosphates to the latter country. Under the terms of this agreement the Italian Government, besides the supply of 100 miners promised last year, will provide for 600 more miners, which are necessary in order to increase the output of phosphates, and, at the same time, will authorise the export of 60,000 tons of pyrites from the Montecatini. In exchange Italy will receive 325,000 tons of phosphates, plus 50 per cent. of the increased output, which it is hoped will be 300,000 tons more than the present amount of two million tons. Italy will also receive 30 per cent. of any further quantities that may be available for export.

At a meeting of the Manchester Section of the Society of Dyers & Colourists, on Friday, December 17, a paper on "The Tensile, the Bursting and the Ripping Strain of Fabrics" was read by Mr. J. Huebner, who said that the load under which a fabric broke when a tensile strain was applied, had hitherto usually been considered as a true indication of its strength, and the effect of the processes through which a fabric had to pass and of the chemical agents employed in the processes, had, as a rule, been judged by its tensile strain. It had, however, been found that the resistance of a fabric to bursting or to ripping affords often valuable additional information, and in many cases a bursting or a ripping test might replace the more tedious tensile test. The variations in strength in one fabric were very considerable, and, therefore, too much value should not be attached to average figures which were the result of a small number of tests. The results of a great number of tests showed that the bursting strain of a fabric was comparable with its tensile strain, but that the ripping strain of fabrics was as a rule very low as compared with the tensile strain.

Uses of the Rotary Meter

A CORRESPONDENT familiar with the rotary meter manufactured by the Rotary Meter Co. (1905), Ltd., states that this meter has been used with great success in all kinds of works wherever gases have been required to be measured. It has been applied for the measurement of air, coal gas, ammonia, carbon di-oxide, &c., both in this country and on the Continent. It has measured gases of fairly high temperatures and below freezing point of water. It has been used for the measurement of flows as low as 5 ft. per hour and as high as 1,000,000 ft. per hour. It can be used for the measurement of either low or high pressure gases. The meter claims to be correct at all flows of gas between its maximum rated capacity and at one-tenth of that capacity. Its principle is that of a rotating fan mounted on jewelled bearings. The gas is directed on to the fan blades by a series of carefully calibrated tubular orifices, and is tested at ten rates of flow and a curve of accuracy supplied with each meter where desired.

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PRACTICAL BIOLOGICAL CHEMISTRY. By Gabriel Bertrand and Pierre Thomas, London, G. Bell & Sons, Ltd., pp. 384. 10s. 6d. net.

SMITHSONIAN PHYSICAL TABLES. Seventh revised edition. Prepared by F. E. Fowle. Washington, Smithsonian Institution. Pp. 450.

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A TEXT-BOOK OF ORGANIC CHEMISTRY. By A. F. Holleman. London, Chapman & Hall. Pp. 642. 18s. 6d. net.

COMPARATIVE THERM TABLES. By H. R. Askew. London: Benn Brothers, Limited. Pp. 69. 5s. net, post free 5s. 6d.

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Abstracts of Complete Specifications

153,926. VANADIUM FROM CERTAIN IRON ORES, PROCESS FOR RECOVERING. W. M. Goodwin and A. F. G. Cadenhead, Queen's University, Kingston, Ont., Canada. Application date, May 16, 1919.

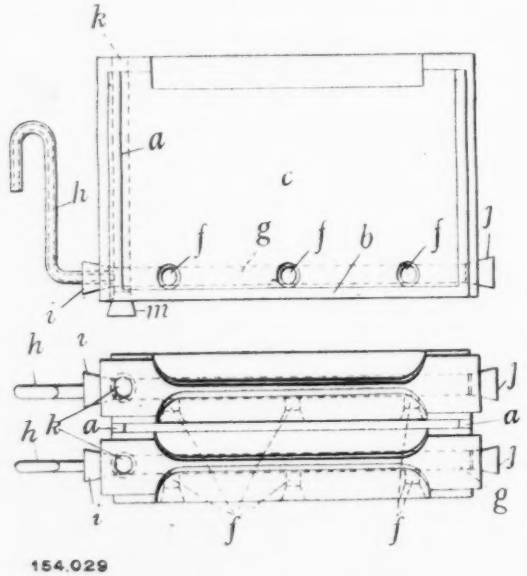
The object is to recover vanadium from iron ores in such a manner as to facilitate its use in steel manufacture. The ore is smelted in an electric or blast furnace with carbon and a flux such as silica, sand or silicious iron ore which causes the vanadium to go into the pig iron instead of into the slag. This pig iron is then decarburized in another furnace which transfers the vanadium to the resulting slag. This slag is mixed with fresh ore and treated in the first furnace so that the pig iron obtained from it contains an increased proportion of vanadium. This process may be repeated as often as is necessary to raise the proportion of vanadium in the iron to the required amount. Steel is made by adding pig iron containing vanadium to the decarburized iron obtained as above. The proportion of other ingredients such as chromium is adjusted to the required amount by adding chromite or the like to the ore in the first smelting furnace.

153,942. OLEAGINOUS SUBSTANCES, PROCESS OF PRODUCING SOLIDIFICATION OF. B. Scobel, 1046, Hoe Avenue, New York. Application date, August 5, 1919.

The object is to obtain a solid composition from Chinese wood oil or tung oil. Ferric chloride is ground in an indifferent oil, such as rosin oil or linseed oil, and then mixed with Chinese wood oil or tung oil and the mixture warmed, when it solidifies. Alternatively the ferric chloride may be mixed with or dissolved in other anhydrous inert solvents such as acetone or ether. The mixture may be subjected to a vacuum to remove air before heating to 80°-100°C., and the product may be hardened by subjection to pressure. Other metallic halogen derivatives may also be used as solidifying agents, such as anhydrous stannic chloride in anhydrous acetone. Filling material, such as infusorial earth, wood or cork flour, iron oxide, or magnesium silicate may also be added.

154,029. BI-POLAR ELECTRODE ELECTROLYSERS. G. G. Hepburn, 52, Newport Road, Chorlton-cum-Hardy, Manchester, and Mather & Platt, Ltd., Park Works, Manchester. Application date, September 26, 1919.

The electrodes *c*, *d*, are separated by side and bottom walls



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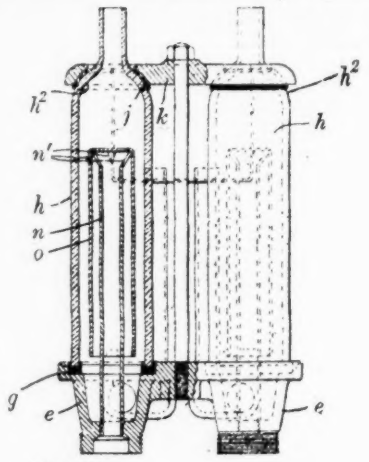
a, *b*, so that the space between them is only open at the top. The exit for the electrolyte is provided by channels *f* extending from the face of the electrode within the cell to a cross-channel *g* to the end of which a syphon tube *h* is fixed, and extends to the required height to maintain the cell charged with electrolyte. Instead of the channels *f*, *g* a single inclined channel may be provided in each electrode, extending from the active face to the end of the electrode. Vertical passages *k* are provided in each electrode communicating with the passages *g* to allow gas to escape. In an alternative form, the syphon tube *h* may be connected to an aperture in the side wall *a* of the cell. In another alternative, a partition may be provided parallel and close to the wall *a* to direct the liquid from the bottom of the cell to an outlet in the wall *a* near the top.

154,048. COKE-FIRED CRUCIBLE FURNACES AND THE LIKE, ECONOMISER FOR. G. Batty, 36, Fossdale Road, Sheffield. Application date, October 22, 1919.

The flue of a crucible furnace is provided with a pivoted cover of refractory material so that the passage of cold air through the flue when not in use may be prevented and excessive cooling of the furnace avoided. The flue cover consists of a metal frame and a refractory plate detachably held within it by screws which extend through the frame and press against strips on the edges of the plate of refractory material.

154,089. ELECTROLYTIC CELLS, INDICATORS FOR. I. H. Levin, 2635, Penn Avenue, Pittsburgh, Pa., U.S.A. Application date, December 31, 1919.

The indicator forms part of the gas offtake system for elctrolytic cells for generating oxygen and hydrogen, and is provided with two branches *e* communicating with different gas compartments within the cell. A casing *h* of glass is supported between a bridge *k* having a resilient cushion *j* and a gasket *g* of rubber or the like, so that expansion or contraction of the glass may take place without breakage. The glass casing is reduced in diameter at h^2 and the bridge *k* rests on the spherical portion. The gas passes upwards through the tube *n* and then through perforations n^1 into the outer tube *o* from the lower end of which it passes upwards through the liquid which is maintained at a substantially constant level and acts as an indicator. The use of the glass casing *h* prevents leakage of current from the cell to the offtake system.



154 089

154,108. COPPER AND ZINC, PROCESS FOR THE ELECTRO-DEPOSITION OF ALLOYS OF. S. O. Cowper-Coles, Rossall House, Thames Street, Sunbury-on-Thames, Middlesex. Application date, February 24, 1920.

In the electrolytic deposition of copper alloys the electrolyte, consisting of a copper salt, is rapidly circulated over the articles or cathodes. Copper anodes are used, and a suitable zinc salt is added continuously to the electrolyte to give the

desired composition of the alloy. A coating for iron or steel which is superior to zinc in protecting the metal from corrosion may be obtained by the above process, the copper and zinc being in equal proportions. The deposition of alloy may be controlled by using a test piece in the form of a thin metallic ribbon which continuously passes through the electrolytic cell and is slowly wound up by suitable mechanism. The zinc salt may be added to the solution continuously by an automatic regulating device.

154,111. POTASSIUM SULPHATE AND HYDROCHLORIC ACID, MANUFACTURE OF. Fabriques de Produits Chimiques de Thann et de Mulhouse, Thann, Alscace. International Convention date (France), December 4, 1919. Addition to 137,296. (*See* THE CHEMICAL AGE, Vol. II., page 287.)

Finely pulverised potassium chloride is mixed with sulphuric acid in such proportions that the mixture remains pulverulent. The mixture is heated in a direct flame furnace or in a compound direct flame and muffle furnace so that it is first desiccated at 120°C. to 300°C., and finally heated to 700°C. to 800°C. The mass is passed through the desiccating zone at a rate sufficiently slow to ensure that it remains solid and porous. In the prior patent the sulphuric acid used was of 70-72 per cent. strength, but it is now found that a more concerntated solution may advantageously be used.

154,112. METAL PYROPHOSPHATE CASEIN COMPOUNDS, MANUFACTURE OF COLLOIDALLY SOLUBLE. H. R. Napp, 7 & 8, Idol Lane, London, E.C. 3. (From F. Hoffmann-La Roche & Co., 184, Grenzacher St., Basle, Switzerland.) Application date, February 28, 1920.

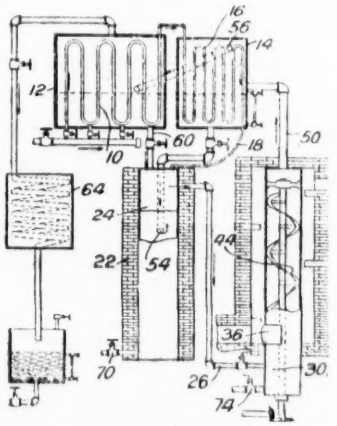
Casein is dissolved in a solution of sodium pyrophosphate and a solution of calcium chloride or ferric chloride added. The colloidally soluble compound obtained is precipitated with alcohol washed and dried at 50°C. The compounds are used for therapeutic purposes.

Note.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE, when they became open to inspection under the International Convention :—138,328 (Vereinigte Chemische Werk Akt.-Ges.), relating to manufacture of glycerol from sugar, *See* Vol. II., p. 386; 144,712 (Karl, Prince of Lowenstein, A. Irinyi, and T. Kayser), relating to low-temperature distillation of coal shale, &c., *see* Vol. III., p. 214; 150,991 (Dayton Metal Products Co.), relating to hydrogenation apparatus, *see* Vol. III., p. 634.

International Specifications Not Yet Accepted

151,925. HYDROCARBON OILS, CRACKING. R. D. George, 845, Eleventh Street, Boulder, Colo., U.S.A. International Convention date, September 30, 1919.

The oil is cracked in a vertical still 30, provided with a rotating scraper 44, to remove continuously the carbon deposit as it is formed. The still is kept full of oil, and vapour and oil pass through the pipe 50 to a chamber 14, from which the vapour passes by a pipe 56 to a chamber 12 to condense the heavier constituents. The temperature of the chamber 12 is regulated by pipe coils 10, through one or more of which the cold oil supply is passed. The heavy condensate passes into a vessel 22 and the vapour passes to a condenser 64. The liquid oil which is separated in the chamber 14 passes through a pipe 54 to the vessel 22, through which it rises upwards and is filtered by the screen 24 which retains the carbon. The oil returns through the pipe 26 to the still 30. The pressure in the oil circuit is maintained between 60 lb. and 120 lb. per square inch by a pump, and the temperature between 370° and 450°C. The coils 10 and 16 act as preheaters for the oil.



151,925

151,952. SILVER AND LEAD CHLORIDES. Amalgamated Zinc (de Bavay's), Ltd., 360, Collins Street, Melbourne. International Convention date, October 3, 1919.

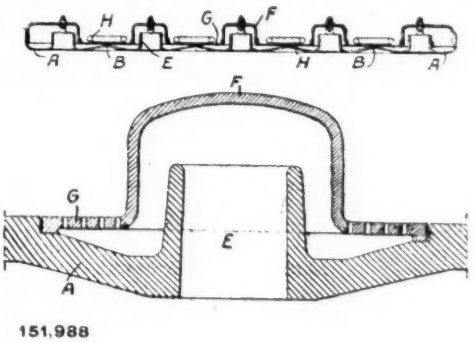
Complex sulphide ores are heated with zinc chloride out of contact with air to chloridise the lead and silver, but not the zinc. The ore is then freed from excess of zinc chloride by washing with acidulated water, and then leached with cold brine saturated with lead chloride and acidulated with hydrochloric acid. The silver is thereby extracted and the residue is treated with hot brine to extract the lead.

151,984. AMMONIA. C. T. Thorssell and H. L. R. Lunden, 20, Kopmansgatan, Gothenburg, Sweden. International Convention date, October 6, 1919.

Nitrogen is fixed in the form of cyanide, by heating a base carbon and a metallic catalyst in an atmosphere of nitrogen, and the hot mass is discharged directly into an autoclave containing water. Air is excluded, and a gas containing no free oxygen is maintained above the liquid in the autoclave, so that no explosive mixture is formed when hydrogen is liberated.

151,988. COLUMN STILLS AND RECTIFIERS. E. Barbet et Fils et Cie, 5, Rue de l'Echelle, Paris. International Convention date, October 1, 1919.

A column still is provided with plates A having openings E separated by transverse ridges B. The openings E are covered by transverse hoods F with perforated plates G of copper, gunmetal, phosphor bronze, porcelain, or earthenware, so that a horizontal perforated surface is obtained. Liquid collects in the depressions between the ridges when the pressure falls in the still. Cooling coils H may be provided between the hoods. When a still is constructed of ceramic material or lava for treating acids, the hoods F and plates G may be circular.



151,988

151,989. FERTILISERS. Soc. l'Azote Francais, 126, Rue de Provence, Paris. International Convention date, October 4, 1919.

A mixture of calcium cyanamide with a gelatinous substance derived from seaweed, and water, with or without kainite, is formed into granules and dried. The seaweed extract may be omitted.

152,009. COKE OVENS. American Coke & Chemical Co., 208, South La Salle Street, Chicago. (Assignees of C. S. Lomax, 208, South La Salle Street, Chicago.) International Convention date, October 3, 1919.

Vertical coke ovens are heated by a series of groups of flues in the side walls, each group comprising two vertical flues connected at the top by a cross passage. A damper is provided in one of the flues near the top. Gas and air are supplied

from both sides of the bench to the bottom of one of the heating flues of each group, and the other flue discharges into a horizontal sole passage below the oven and common to the flues on either side. Two regenerators are provided below each oven and each is provided with a baffle plate to compel the gases to traverse the length of the regenerator and return to the inlet end.

152,011. AMMONIA. C. T. Thorssell and H. L. R. Lunden, 20, Kopmansgatan, Gothenburg, Sweden. International Convention date, October 6, 1919.

Cyanide or cyanamide as produced and when still hot, is placed in a pressure vessel with water for the production of ammonia. The heat is thus utilised in heating the water to the required temperature.

152,026. POTASSIUM SALTS. G. A. Blanc, 56, Via Fontanello di Borghese, and F. Jourdan, 186, Via del Babuino, both in Rome. International Convention date, October 6, 1919.

Leucite is calcined either alone or with superheated steam, lime, or magnesia, and is then ground to an impalpable powder. The potash may then be extracted with acetic, formic, citric, oxalic, or carbonic acid for use as a fertiliser.

152,029. ZINC AND OTHER ORES, TREATING. Metals Extraction Corporation, McKinley Building, Joplin, Mo., U.S.A. (Assignees of A. Schwarz, 1918, Seargent Avenue, Joplin, Mo., U.S.A.) International Convention date, October 6, 1919.

Ores containing sulphides, carbonates, silicates, &c., are roasted if necessary and mixed with a binder such as starch paste with or without powdered coal. The mixture is then mixed with pieces of refractory material such as slag, in a pug mill, so that the pieces of slag are coated with the paste. These pieces are then placed on a bed of fuel in a grate and air is forced through to reduce the ore and volatilise the most volatile metals. The fume may be condensed as metal, *e.g.*, zinc, or more air may be used to produce the oxide.

152,031. NITRIC ACID. Soc. l'Azote Francais, 126, Rue de Provence, Paris. International Convention date, October 8, 1919.

Dilute oxides of nitrogen are absorbed in water which is distributed over fibrous substances such as glass wool or asbestos, and the nitric acid produced is then expressed from the material. The absorption may be made continuous by supplying water to the top of a tower through which the gas is passed. Acid of 55 per cent. strength may thus be obtained; if the required strength is below 50 per cent., cotton may be used instead of glass wool or asbestos.

LATEST NOTIFICATIONS

155,241. Cooling-devices of multistage centrifugal compressors. Soc. Anon. Des Ateliers De Constructions Mechaniques Escher, Weyss, et Cie. December 8, 1919.

155,245. Liquid governers. Akt.-Ges. Brown, Bouverie, et Cie. December 6, 1919.

155,246. Method of treating ores and the like. Moa Iron and Development Corporation. December 8, 1919.

154,915. Machinery or apparatus for the manufacture of glass bottles and other brown glassware. Wilzin Automatic Bottle-Making Machine Company. September 3, 1919.

154,938. Manufacture of coal distillation products. Fleischer, E. December 8, 1916.

155,209. Method and apparatus for the production of fuel. Bates, L.W. December 10, 1919.

155,212. Process of making a liquid-fuel. J. J. V. Armstrong. February 16, 1914.

Specifications Accepted, with Date of Application

127,255. Chlorides. Process and apparatus for the electrolytic decomposition of. R. Cataldi. May 20, 1918.

130,962. Solvents, Process for the recovery of. E. I. Du Pont de Nemours & Co. August 8, 1918.

140,371. Hydrogenation of unsaturated organic compounds, Catalysts for use in. Nordiske Fabriker De-No-Fa Aktieselskap. March 17, 1919.

141,739. Volatile solvents, Method of recovering. H. Schmidt August 7, 1915

154,935. Electrolysis. M. A. Adam, J. Stevenson, A. T. Mabbitt and J. Fieldhouse. February 27, 1919.

154,641. Centrifugal machine for filtering or extracting liquids, semi-liquids and other substances. J. McIntyre. May 30, 1919.

154,656. Phenolic bodies with aldehydic compounds, Condensation of. Vickers, Ltd., Ioco Rubber & Waterproofing Co., and W. H. Nuttall. July 29, 1919.

154,658. Carbonaceous material, Apparatus for treating—for the recovery of voltaile hydrocarbon constituents. C. C. Bussey. July 29, 1919.

154,680. Acetic acid, Manufacture of. H. Dreyfus. August 28, 1919.

154,718. Lead and zinc. Treatment of sulphide ores containing. P. A. Mackay. September 4, 1919.

154,762. Evaporating processes. J. C. Stead. October 14, 1919.

154,810. Potassium bichromate and sodium bichromate, Manufacture of—and production of normal sulphates of potassium and sodium. R. L. Datta. January 5, 1920.

Applications for Patents

Binnie, J. S. Submersible hydraulic pumping machinery. 35,127. December 14.

Blake, S. W. Alcohol fuels. 35,447. December 16.

,, Making alcohol fuel. 35,448. December 16.

British Cellulose & Chemical Manufacturing Co. Treatment of products made with cellulose derivatives. 35,629. 35,630. December 18.

British Dyestuffs Corporation. Manufacture of new series of soluble acid colouring matters, and of new series of intermediate compounds for manufacture thereof. 35,647. December 18.

Clavel, R. Process for dyeing cellulose acetate. 35,196. December 14.

Cleworth, Wheal & Co. Purification of air and gas. 35,646. December 18.

Cuthbert, H. H. Manufacture of decarbonizing agents for internal-combustion engines, &c. 35,224. December 14.

Goodbridge, A. J. Apparatus for clearing interior of ascension pipes of coal-gas retorts. 35,567. December 18.

Green, A. G. Manufacture of new series of soluble acid colouring-matters, and of new series of intermediate compounds for manufacture thereof. 35,647. December 18.

Griffiths, W. Machines for manufacture of composition fuel. 35,572. December 18.

Hall, H. C. Aluminium bronze alloys. 35,509. December 17.

Hey, H. Method of removing suspended matters from oils and from solvents containing oils in solution. 35,382. December 16.

Higginson, G. S. Rotary pumps. 35,145. December 14.

Hoffmann-La Roche Chemical Works. Boxes or containers. 35,459 December 16.

Leask, H. N. Purification of air and gas. 35,646. December 18.

Norsk Hydro-Elektrisk Kvælstofaktieselskab. Production of concentrated nitrous gases. 35,222. December 14. (Norway, May 5).

Reavell (W.) & Co. Air-compressors. 35,535. December 17.

Richardson, L. G. Treatment of products made with cellulose derivatives. 35,629. 35,630. December 18.

Saunders, K. H. Manufacture of new series of soluble acid colouring-matters, and of new series of intermediate compounds for manufacture thereof. 35,647. December 18.

Scheibler, H. Manufacture of sulphur preparations of the thiophene series. 35,523. December 17. (Germany, November 24, 1915.)

Schou, E. V. Manufacture of margarine and edible fats. 35,553. December 17.

Slatineanu, E. Catalytically obtaining reactions between a gas and another substance. 35,401. December 16. (Switzerland, November 5.)

Smith, D. J. Gas-producers. 35,220. December 14.

Soc. l'Air Liquide Soc. (Anon. pour l'Etude et l'Exploitation des Procédés G. Claude). Direct synthesis of ammonia. 35,354. December 15. (France, December 15, 1919.)

Sturgeon, R. A. Centrifugal separators. 35,033. December 13.

Trent, W. E. Treatment of carbonaceous materials. 35,332. December 15. (United States, February 25.)

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Huddersfield Technical College Chemical Society held a meeting on Friday, December 17, when Mr. H. H. Gray lectured on "Combustion and Fuel." After an historical survey the lecturer indicated the national importance of the study of fuel conservation and economical power generation. The proposed provision of huge super-stations for electric power generation was criticised as being wasteful, since the thermal efficiency of electric power generation is only two-fifths that of gas power. The projected scheme for harnessing the Severn was favourably commented upon, as being a step in the right direction for using natural power.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

WEDNESDAY, December 22.

There is practically no alteration to be reported in the current position of the market. Trade has assumed a holiday aspect and enquiry is extremely limited. There is still a fairly confident feeling that values are practically at the bottom and that an improvement may be expected early in the New Year.

There is no change in the export position which still continues extremely quiet.

General Chemicals

ACETONE is in slightly better demand at the last quoted price.

ACETIC ACID is without feature with very little business passing.

ACID CARBOLIC is stagnant and there is no trade to report.

ACID FORMIC still continues a weak market and quotations are in buyers' favour.

ACID OXALIC is in very quiet demand and the price is without change.

ACID TARTARIC.—There is no change in this position and the market still continues in buyers' favour.

BLEACHING POWDER is idle and there are cheap offers from the Continent.

COPPER SULPHATE is in small enquiry, but practically no business is passing and the price continues to drop.

FORMALDEHYDE seems a little better on the week, but only a small business is passing.

LEAD SALTS are easy with practically no business passing.

MAGNESIUM SALTS are very quiet and on the easy side as regards value.

POTASSIUM BICHROMATE is quiet, but the price is maintained.

POTASSIUM CARBONATE is offered at lower prices, but little business is being done.

POTASSIUM CAUSTIC is again easier and is not in demand.

POTASSIUM PRUSSIATE is only a moderate market and values are fairly well maintained.

SODIUM ACETATE is not very active, but the price is maintained.

SODIUM CAUSTIC is still offered at a low price, but little is being absorbed.

SODIUM BICHROMATE is a shade easier, but the price would now appear to be approaching the bottom for second-hand parcels.

SODIUM HYPOSULPHITE is a shade easier, but little business is passing.

SODIUM NITRATE is offered, but there are few transactions.

SODIUM PRUSSIATE has a better market, but is without feature as regards price.

ZINC SALTS are in very moderate request without nominal change in values.

Coal Tar Intermediates

We have nothing special to report this week in this market and most buyers and producers are content to mark time for the present.

ALPHA NAPHTHOL is without feature, but the price is maintained.

BETA NAPHTHOL is in very small request and makers hold to their price.

DIMETHYLANILINE is in buyers' favour, but little business is possible.

PARANITRANILINE continues in quiet demand and the price is maintained.

SALICYLIC ACID.—There is no change to report and only a small business is being transacted.

Coal Tar Products

The market remains extremely quiet for nearly all products.

90's BENZOL.—The demand is very irregular and quotations to-day are 3s. 3d. to 3s. 4½d. on rails in the North, and 3s. 6d. to 3s. 8d. in London.

PURE BENZOL is worth 3s. 10d. to 4s. per gallon in the Midlands and in the South.

CREOSOTE OIL.—There is a fairly steady demand, but prices are somewhat easier at 1s. 1½d. per gallon in the North, and 1s. 2½d. to 1s. 3d. in the South.

CRESYLIC ACID is still in poor demand and is quoted 3s. 11d. on rails for 95/97 per cent. and 4s. 3d. to 4s. 4½d. for pale, 97/99 per cent.

SOLVENT NAPHTHA.—There is a little more enquiry, but no more business has resulted. Quotations to-day are 2s. 9d. to 3s. per gallon on rails at works.

HEAVY NAPHTHA is in better demand at 3s. to 3s. 3d. per gallon.

NAPHTHALENE remains very quiet, and there are sellers at £12 to £20 for crude, according to quality, and £34 to £38 for refined.

PITCH.—The market is inactive and dull. Some business has been done at 175s. f.o.b., East Coast.

Sulphate of Ammonia

The Home Trade prices have been reduced—January £23 10s., February £24 3s. 6d., March-May £24 11s., and the prices for Export are £27 and £28 to £30 for forward business.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	6	to	0	3	0
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	115	0	0	to	120	0	0
Acid, Acetic, glacial, 99-100%	ton	77	10	0	to	80	0	0
Acetic, 80% pure	ton	65	10	0	to	66	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	0	10½	to	0	0	11
Citric	lb.	0	3	0	to	0	3	3
Formic, 80%	ton	90	0	0	to	95	0	0
Gallic, pure	lb.	0	6	3	to	0	6	6
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	37	10	0	to	40	0	0
Lactic, 60 vol.	ton	47	10	0	to	50	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	1	4	to	0	1	5
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	1	8	to	0	1	10
Salicylic, B.P.	lb.	0	2	0	to	0	2	3
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	2	2	to	0	2	4
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	60	0	0	to	65	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	17	10	0	to	18	10	0
Aluminium, sulphate, 17-18%	ton	20	10	0	to	21	10	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	7½	to	—		
Ammonia, chloride	ton	95	0	0	to	100	0	0
Ammonia, muriate (galvanisers)	ton	60	0	0	to	65	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	110	0	0	to	115	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0
Arsenic, white, powdered	ton	80	0	0	to	82	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0

	per	£	s.	d.		£	s.	d.
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	23	0	0	to	24	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	8
Bleaching powder, 35-37%	ton	30	0	0	to	31	0	0
Borax crystals	ton	41	0	0	to	42	10	0
Calcium acetate, Brown	ton	19	0	0	to	20	0	0
,, Grey	ton	29	0	0	to	30	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	1	0	0	to	1	0	6
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	41	0	0	to	42	0	0
Cream Tartar, 98-100%	ton	220	0	0	to	225	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	130	0	0	to	135	0	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts	ton	Nominal.						
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	67	10	0	to	70	0	0
Carbonate (White Lead)	ton	61	0	0	to	63	0	0
Nitrate	ton	62	10	0	to	65	0	0
Litharge	ton	57	0	0	to	59	0	0
Lithopone, 30%	ton	40	0	0	to	41	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	12	10	0	to	13	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	19	0	0	to	—		
Sulphate	ton	130	0	0	to	135	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.	Nominal.						
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potassium bichromate	lb.	0	1	3	to	0	1	4
Carbonate, 90%	ton	90	0	0	to	95	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	215	0	0	to	225	0	0
Nitrate, refined	ton	65	0	0	to	67	0	0
Permanganate	lb.	0	3	0	to	0	3	3
Prussiate, red	lb.	0	3	3	to	0	3	6
Prussiate, yellow	lb.	0	1	8	to	0	1	10
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	10	0	to		—	
Seconds	cwt.	5	5	0	to		—	
Sodium acetate	ton	48	0	0	to	50	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	9½	to	0	0	10
Bisulphite, 60-62%	ton	37	10	0	to	40	0	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	30	0	0	to	31	0	0
Caustic, 76%	ton	31	0	0	to	32	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	27	10	0	to	30	0	0
Nitrite, 96-98%	ton	69	0	0	to	70	0	0
Phosphate, crystal	ton	37	0	0	to	39	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	1	to	0	1	1½
Sulphide, crystals	ton	25	0	0	to	27	10	0
Sulphide, solid, 60-62%	ton	45	0	0	to	47	0	0
Sulphite, cryst	ton	17	10	0	to	18	10	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	90	0	0	to	95	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	10	to	0	3	0
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	56	0	0	to	57	0	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21				23	10	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	3	to	0	3	6
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	9	to	0	6	0
Benzidine, base	lb.	0	11	6	to	0	12	0
Benzidine, sulphate	lb.	0	10	0	to	0	10	6
Benzoic acid	lb.	0	2	9	to	0	3	0
Benzoate of soda	lb.	0	3	0	to	0	3	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	10	0	to	0	11	0
Betanaphthol	lb.	0	3	0	to	0	3	3
Betanaphthylamine, technical	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	9	to	0	6	0
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	14	0	to	0	14	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthienic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	0	to	0	5	6
Nitronaphthaline	lb.	0	1	6	to	0	1	8
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	1	3	to	0	1	4
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	7	6	to	0	7	9
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	8	3	to	0	8	6
Phthalic anhydride	lb.	0	4	9	to	0	5	0
R. Salt, 100% basis	lb.	0	4	0	to	0	4	1
Resorcin, technical	lb.	0	7	6	to	0	8	6
Resorcin, pure	lb.	1	2	0	to	0	12	6
Salol	lb	0	4	6	to	0	4	9
Shaeffer acid, 100% basis	lb.	0	3	6	to	0	3	9
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Cardiff By-Products Market

CARDIFF, DEC. 21.

Sulphate of Ammonia—	
For home consumption (per ton o.t.)	£25 net d.d.
For export (per ton f.o.b.)	£25 to £35
Benzol, 90's (per gallon)	3s. 5d. to 3s. 10d.
Benzol, 50's (per gallon)	3s. 5d.
Solvent Naphtha (per gallon)	3s. to 3s. 2d.
Heavy Naphtha (per gallon)	3s. 3d. to 3s. 4½d.
Crude Naphthalene Salts (per ton)	£16 to £26
Pitch (per ton)	190s. to 200s.
Creosote (per gallon)	1s. 2d. to 1s. 4d.
Motor Benzol (per gallon)	3s. 5d. to 3s. 10d.
Crude Benzol (per gallon)	1s. 9d.
Toluol (per gallon)	4s.

Recent Wills

Mr. W. H. Shepherd, of 5, Union Terrace, and 6, Bonaccord Crescent, Aberdeen, retired wholesale druggist	£84,387
Mr. W. Foster, of St. Martin's Terrace, Chapeltown Road, Leeds, of B. Foster & Sons, chemical manufacturers	£17,550
Mr. R. Taylor Forbes, of Buxton Road, Stockport, chemist and druggist	£9,161

Company News

EXPLOSIVES TRADES, LTD.—Half-yearly preference dividend due on February 1 has been sanctioned.

CASTNER-KELLNER ALKALI.—Final dividend of 12 per cent. having been declared makes the total for the year ended September 30, 22 per cent.

BRITISH CYANIDES.—A majority holding in the British Potash Co. has been acquired by the British Cyanides Co., Ltd., by arrangement with the Government and the shareholders. Mr. Ben Walmsley and Sir Herbert Jackson are now directors of the Company. Brigadier-General O. K. Chance, is the sales manager for both Companies.

SAPON SOAPS.—The report for the year to September 30 states that sales show an increase, as compared with the previous year; cost of raw material, wages, &c., increased to a much greater extent than it was possible to compensate by increased selling prices. The cost of raw materials has recently fallen, and the outlook is considered to be more favourable. A balance of £3,069 was brought forward, and the interim dividend on the preference shares for the half-year to March 31 was paid, leaving £203 to carry forward.

OILFIELDS OF ENGLAND.—The report for the 10 months ended September 30 last states that operations were considerably handicapped owing to the continued difficulties of securing delivery of essential plant from the United States, as a result of which it was not possible to start actual drilling operations on the site selected for the company's first well at Kelham, near Newark (Notts), until September 8 last. Drilling has been energetically proceeded with since that date, and the well has now reached a depth of 1,177 ft. It is hoped that the oil-bearing stratum proved by the vendor's trial bore will be reached early in the new year. A contract has been placed for the supply of suitable storage accommodation, which is now in course of erection.

BRITISH GLASS INDUSTRIES.—The first ordinary general meeting was held on December 8, Mr. Williamson Milne, chairman, persiding. A promise of a dividend of 10 per cent., payable at the end of September, had been given on account of profits for the current financial year. This was paid in due course. The chairman said that in a very few weeks they would possess at Canning Town and Charlton two of the best equipped automatic glass factories in the world, which, owing to their good geographical situation, were in a better position than those of any of their competitors for dealing with the export demands of the world. The chemical, optical and illuminating branches of Webb's were not in such a fortunate position, as, although they had made great strides during the war, and it was generally conceded that their quality could not be surpassed, yet it was imperative, if that measure of success at which they aimed was to be achieved, that their efforts should be fostered by the Government in the shape of inclusion in the Key Industries Bill. Before the war this country was practically at the mercy of Continental manufacturers for the supply of such articles as chemical, optical and illuminating glass.

ANGLO-PERSIAN OIL.—Sir Charles Greenaway, chairman, presided at the ordinary general meeting on Monday. There was, he said, a substantial increase in profits. Capital and debenture stocks had during the year been increased by £8,675,000. Total reserves now amounted to £2,000,000. Realisable assets amounted to about £8,370,000, while off-setting liabilities only amounted to about £2,500,000, showing that they had surplus assets amounting to nearly £6,000,000 at the end of the last financial year. Gross profits amounted to £3,458,418, as compared with £2,287,624 in the previous year. The net balance at the credit of the profit-and-loss account amounted to £1,848,841, as compared with £735,527. The usual 6 per cent. per annum on the preference shares had already been paid, and it was now proposed to declare a further participating dividend on the preference shares at the rate of 2 per cent. per annum and a dividend of 20 per cent. per annum on the ordinary shares, both less income tax.

OIL TRUST, LTD.—At the ordinary general meeting held on Monday, Mr. Joseph Brailsford, chairman, presiding, said the directors were able to submit a clean balance sheet. The balance sheet submitted at the last meeting contained items totalling £154,087; assets which included ascertained losses. Little more than a third of the capital of those assets could be regarded as good. The net profit for the period under review was £23,280, which had been earned upon an actual capital of £57,000.

BRITISH CELLULOSE.—The ordinary meeting of the British Cellulose & Chemical Manufacturing Co., Ltd., was held on December 9. The chairman, Sir Harry McGowan, said that the foundation on which the Company stood was the Dreyfus methods for manufacturing cellulose acetate. With the production of cellulose acetate of good quality at a low price a vast new field of industrial enterprise was laid open. The first use to which this process was put was to make a dope for aeroplanes and arishipps. The application was entirely satisfactory. It took time—much longer than was expected—to get the manufacture of acetate commercially started, and its first application to a money-producing commodity, the production of dope, a commercial achievement. But before the end of the war they knew that no business could "live" out of aeroplanes or airships, at any rate for years to come, and that they must proceed with the next application of their basic product, in the manufacture of peace products with a world-wide demand. The next application was artificial silk. Their difficulties, as they expected, were all exaggerated by the fact that their workpeople were all new to the trade, whether the spinning, that was squirting of cellulose acetate solution into the fine threads that ultimately made the thread of silk, or the textile, which was the twisting or manipulating of the thread so obtained, and that in itself produced waste, and did not give the plant a fair chance, and it was difficult at first to judge how much was due to the plant and how much of the operative. That, however, was only a passing trouble, and not more serious than they anticipated. They had discovered that the insulating properties of their silk were several times greater than that of natural silk—a character that opened vast fields for use in the electrical industry. As far as dyeing was concerned, when the dyers come to use it, they would find it as amenable as any other material to dye treatment. In their artificial silk alone they had the foundation of a splendid business, but their cellulose acetate was a much more wonderful substance than one limited to silk. Sir Harry said they had the largest calcium carbide plant in this country, and, subject to Central European competition, saw no difficulty in disposing at any given time of any surplus there might be after providing for their own requirements for the making of cellulose acetate. Their aspirin plant was sufficiently large to render the country independent of foreign supplies and of a quality that had not, they believed, been excelled by any country. Cellulose acetate could be turned into the following additional marketable products, viz.:—(1) Non-inflammable celluloid, (2) non-inflammable films, and (3) spondite—a substitute for glass. Many of the fields open to a safety celluloid could not be entered by nitro-celluloid because of its inflammability. Cellulose acetate possessed the essential qualities for the production of a safe substitute for celluloid.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Nantes ...	Linseed oil	837
Palermo	Soda; galvanised sheets; zinc	838
Genoa	Non-ferrous metals	839
Turin	Chemical products, &c. ...	—
Switzerland—Italy	Pharmaceutical chemicals; oils; fats	—
Hongkong ...	Chemicals	—
Marseilles	Chemicals	—
Johannesburg ...	Glass; paints; grease ...	—
Brussels	Potash; bi-carbonate of soda; petroleum jelly ...	—

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Bankruptcy Information

LEWIS, THOMAS HENRY, 176, Moss Lane East, Moss Side, Manchester, and ASHCROFT, FRANK, 12, Garden Walk, Ashton, Preston, trading in co-partnership under the style of Lewis & Co., at 176, Moss Lane East, Manchester, and 5, Chapman Street, Hulme, Manchester, manufacturing chemists. December 14.

Companies Winding Up Voluntarily

HEDWORTH BARIUM CO., LTD.—Mr. N. Harrison, 31, Mosley Street, Newcastle-on-Tyne, Liquidator.

NATIONAL PAPER & PULP CO., LTD.—Mr. G. H. Wilkinson, 66, Upper Thames Street, London, E.C., Liquidator.

PATENT METALLIC MANUFACTURING CO. (in voluntary liquidation). Creditors' claims on or before January 11 to J. R. Dickin and A. J. K. Scott, 36, Moorfields, Liverpool, Liquidators.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

MERSEY OIL & CAKE MILLS CO., LTD., Liverpool.—Registered December 6, £30,000 (not ex.) mortgage, to Lloyds Bank, Ltd.; charged on premises in Ford Street and Blackstock Street, Liverpool. *Nil. October 14, 1920.

SELBY CHEMICAL CO., LTD.—Registered December 8, £2,435 6s. 11d. mortgage, also mortgage securing all sums which the mortgagees may be called upon to pay under their guarantee to Lloyds Bank, Ltd., and others, both mortgages are in favour of W. Thevenaz and another, Selby, directors of the company; charged on land, premises and fixed plant and machinery at Selby. *£7,000. October 18, 1920.

TURNER'S GLASSWORKS CO., LTD., Worksop.—Registered December 6, deposit of deeds securing £10,000 and all moneys due or to become due, to London County Westminster & Parr's Bank, Ltd.; charged on deeds of freehold buildings and glassworks in Sandy Lane, Worksop.

Bill of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.]

NICHOLAI, J. N., 88, Sinclair Road, Blythe Road, West Kensington, manufacturing chemist. Filed December 16. £60.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

TRESTRAIL, J. P., Porthleven, chemist. £16. 12s. 6d. November 8.

WHITEHEAD, C., 19, Belle Vue Terrace, Bury, chemist. £16. 13s. November 11.

NOBLE, W. D., 2, Wells Street, Cable Street, London, E., chemist. £53. 8s. 10d. October 13.

ROCHESTER, MANUFACTURING CO., LTD., 36, Victoria Street, Westminster, glass manufacturers. £24. 11s. 5d. November 10.

STEVEN, R., 19, Liverpool Road, Stoke-on-Trent, chemist. £11. 3s. November 9.

MASON (VIVIAN) & CO., 52, Lawley Street, Dudley, chemical goods manufacturers. £17. 12s. 6d. November 9.

New Companies Registered

The following have been prepared for us by Jordan & Sons, Lld., company registration agents, 116 and 117, Chancery Lane, London, W.C.:—

CHESEBROUGH MANUFACTURING COMPANY, CONSOLIDATED. (Incorporated in the State of New York.) To manufacture all the products of petroleum. Nominal capital, two million five hundred dollars. Name of person authorised to accept service, A. B. Richardson (resident manager of the company).

JAPLIN'S ANTI-RHEUMATIC SOAP, LTD. Soap manufacturers. Nominal capital, £100 in 2,000 shares of 1s. each. Directors to be appointed by subscribers. Qualification of directors, one share. Subscribers, J. H. Smythe, A. M. Kennsar.

MILLIKEN BROTHERS MANUFACTURING CO., INCORPORATED (incorporated in the State of New York, U.S.A.). To manufacture and generally deal in iron, steel and every other kind of minerals and metals, and to deal in galvanised transmission towers and other light bolted steel or other metal structures. Nominal capital, one thousand dollars. Name of person authorised to accept service, C. T. Wilkinson (engineer).

WILLIAM GREGORY, LTD., 50, Crooms Hill, Greenwich, S.E.10. Manufacturing chemists. Nominal capital, £4,000 in 4,000 shares of £1 each. Directors, A. W. Gregory, F. L. Meadows (permanent directors). Qualification of directors, £100. Remuneration of directors, £150 each; chairman, £600.

YORKSHIRE COAL DISTILLATION, LTD. The coking of coal, the distillation of tar and the manufacture of chemicals and explosives. Nominal capital, £5,050 in 5,000 10 per cent. participating preference shares of £1 each and 1,000 ordinary shares of 1s. each. Directors, N. Deacon, Chase Cliffe, F. A. Anderson, N. P. W. Brady. Qualification of directors, one share.

Big Dye Case Adjourned

In the Chancery Division last week the case before Mr. Justice Russell in which summonses relating to contracts for the supply of dyes by companies whose businesses were ordered to be wound up during the war, was further heard. During the six days the evidence affecting the Badische Co., Ltd., the Bayer Co., Ltd., and the Berlin Aniline Co., Ltd., was taken.

Among those who gave evidence in the case was Mr. Percy Ashley, Secretary of the Board of Trade. Mr. Ashley was particularly concerned with the licences for importation of dyestuffs, he having had charge of the branch dealing with such licences. His evidence was of the efforts which had been made to keep up the supplies of dyes to manufacturers in this country by arrangements with manufacturers of dyes in Switzerland who were supplied with raw material. Mr. Ashley gave as his opinion that nothing was done by the Swiss manufacturers to help maintain the German dye connections in this country, but that they were glad to get rid of German competition. They would not help the Germans after the war to revive their connection in this country. The Board of Trade had no authority regarding the distribution of dyestuffs from Switzerland in this country under arrangement whereby the Swiss manufactured dyes from raw material sent to them, neither did the Government allocate to German firms in this country any of the Swiss dyes.

Among others who have given evidence are Dr. Ernest F. Ehrhardt, Mr. W. Taylor Alexander of the Bayer Co. in England, Mr. W. Strang, of James Strang & Sons, Glasgow, and Mr. W. E. Mounsey, Controller of the Badische Co.

The further hearing has now been adjourned until Jan. 17.

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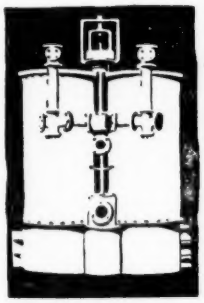

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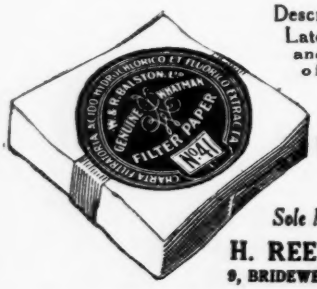

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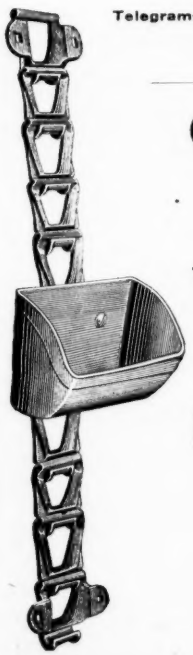

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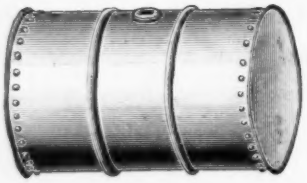

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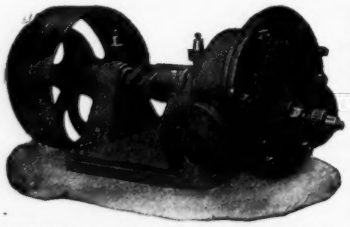

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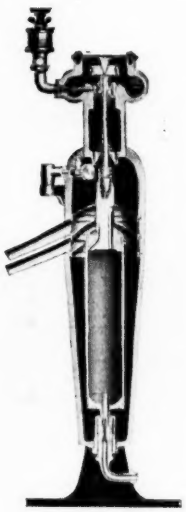

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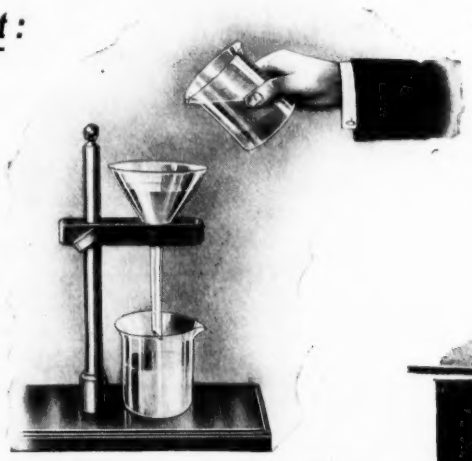

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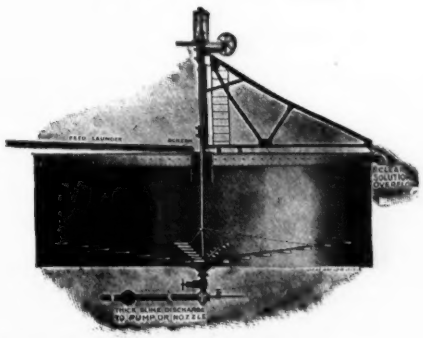

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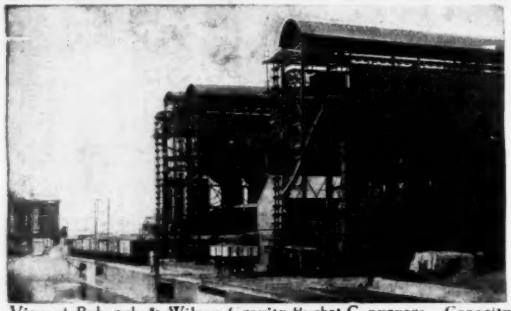

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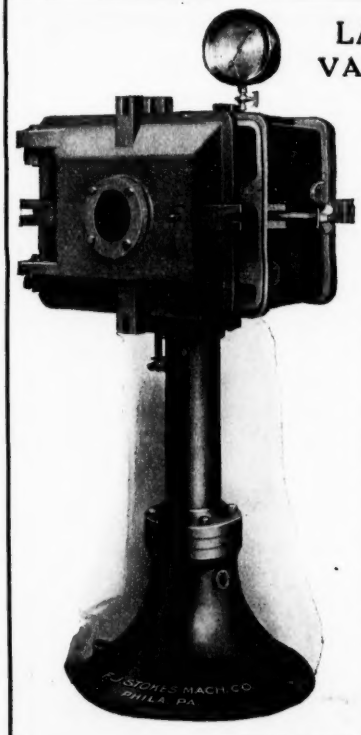

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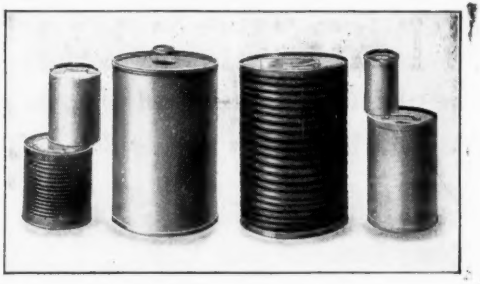

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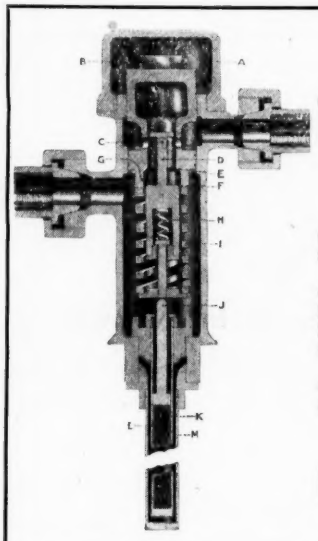

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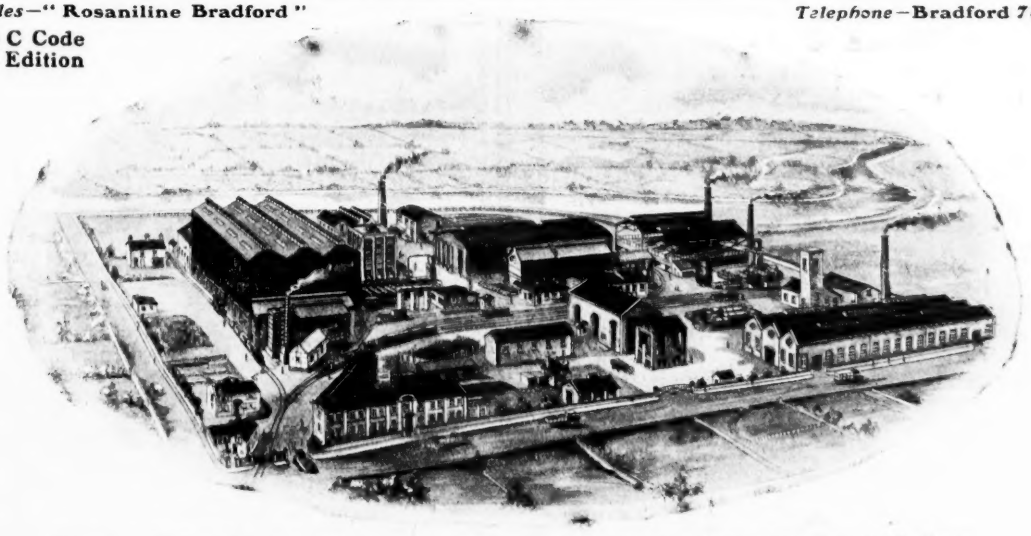

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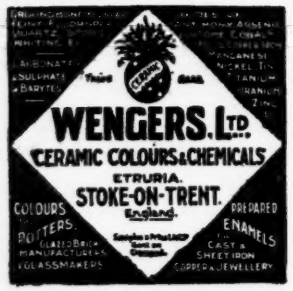

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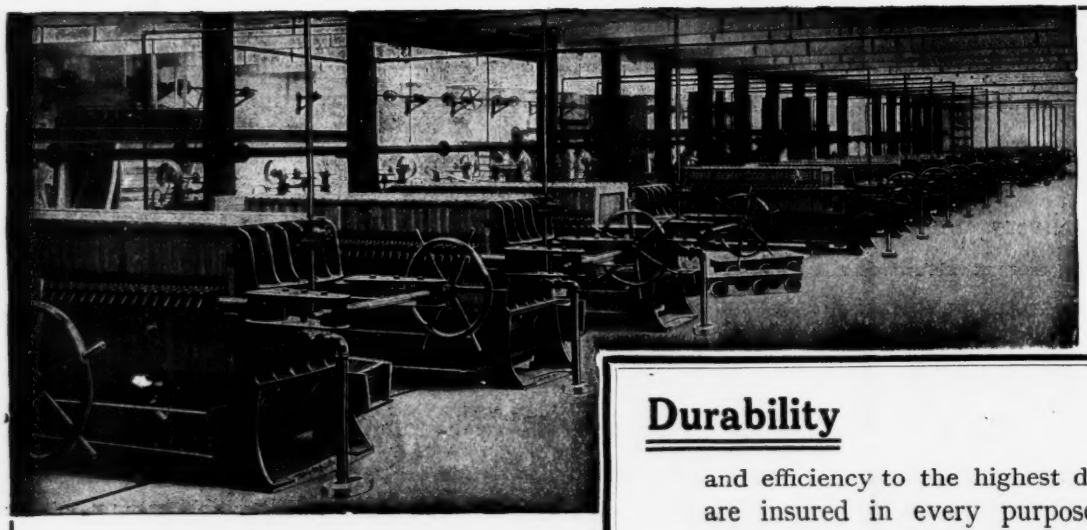

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